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September 27, 2012

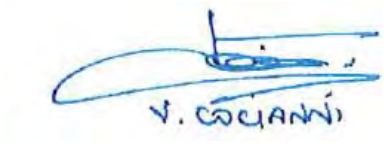
Mr. Craig Zeller
United States Environmental Protection Agency
Region 4, Superfund Division
Atlanta Federal Center
61 Forsyth Street S.W.
Atlanta, Georgia 30303

Re: **Final Supplemental Remedial Investigation Report, Operable Unit 2 of the Sangamo Weston, Inc./Twelvemile Creek/Lake Hartwell Superfund Site, Pickens County, South Carolina**

Dear Mr. Zeller,

Please find enclosed two copies of the above referenced document. If you have any comments or questions, please contact me at (281) 285-4747.

Sincerely,



Virgilio Cocianni
Remediation Manager

c: Greg Cassidy/South Carolina Department of Health and Environmental Control (2 copies)
Dr. Steve Scott/U.S. Army Corps of Engineers (1 copy)
Lillian Furlow/CH2M HILL (1 copy)

Final Report

Supplemental RI Report

Operable Unit 2 of the Sangamo Weston, Inc./ Twelvemile Creek/Lake Hartwell Superfund Site

Pickens County, South Carolina

Prepared for:

Schlumberger
Technology Corporation

Prepared by: CH2MHILL®

September 2012

Final Report

Supplemental Remedial Investigation

Operable Unit 2 of the Sangamo Weston, Inc./Twelvemile Creek/Lake Hartwell Superfund Site Pickens County, South Carolina

Prepared for

Schlumberger Technology Corporation

September 2012

Prepared by

CH2MHILL

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Acronyms and Abbreviations

AOI	area of interest
ASTM	American Society for Testing and Materials
Bechtel	Bechtel Environmental, Inc.
CLP	Contract Laboratory Program
COPC	chemical of potential concern
DQO	data quality objective
ELCR	excess lifetime cancer risk
FS	feasibility study
ft^3/s	cubic feet per second
GPS	global positioning system
HI	hazard index
HHRA	human health risk assessment
HQ	hazard quotient
mg/kg	milligram per kilogram
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OU	operable unit
PCB	polychlorinated biphenyl
QA	quality assurance
QC	quality control
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
RSL	Regional Screening Level
SCDHEC	South Carolina Department of Health and Environmental Control
Schlumberger	Schlumberger Technology Corporation
SRI	supplemental remedial investigation
UFP QAPP	Uniform Federal Policy Quality Assurance Project Plan
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

SECTION 1

Introduction

The Sangamo Weston, Inc./Twelvemile Creek/Lake Hartwell Superfund Site is located in Pickens County, South Carolina (Figure 1-1). The site was divided into separate operable units (OUs) by the U.S. Environmental Protection Agency (USEPA) to expedite remedial investigation and response activities associated with the disposal and discharge of polychlorinated biphenyls (PCBs) from the site. OU1 consists of source areas, including the Sangamo Weston Plant. OU2 comprises the sediment and surface water migration routes downstream from the Sangamo Weston Plant and satellite disposal areas that have site-related PCB contamination.

This supplemental remedial investigation (SRI) report presents the results of an investigation focused on soil and sediments within an approximately 1.5-mile stretch of Twelvemile Creek from 1,500 feet upstream of former Woodside 1 dam to 700 feet downstream of former Woodside 2 dam (Figure 1-2), which is a portion of OU2.

1.1 Regulatory History

The regulatory history of the site, as related to OU2, is summarized in the statements below and explained in further detail in Section 2:

- In January 1987, the site was proposed to the National Priorities List (NPL) and became final on the NPL in February 1990.
- Between 1990 and 1994, USEPA conducted a remedial investigation (RI) /feasibility study (FS) of OU2.
- In June 1994, the Record of Decision (ROD) was issued by USEPA. The remedy selected was monitored natural recovery of low-level, widespread PCB-impacted surface sediments in approximately 730 acres of the Twelvemile Creek arm of Lake Hartwell.
- In September 1998, a Unilateral Administrative Order was issued to Schlumberger Technology Corporation (Schlumberger) by USEPA to implement the remedy.
- In May 2006, state and federal natural resource trustees reached a natural resource damage settlement agreement with Schlumberger by a Consent Decree entered in Federal Court. The settlement required restoration and compensation for alleged injuries to natural resources due to PCB exposure and for alleged lost recreational fishing due to fish consumption advisories. Restoration projects included removal of Woodside 1 and Woodside 2 dams and stream corridor restoration.
- In September 2009, an Explanation of Significant Difference was issued by USEPA to document changes to the June 1994 Final ROD for OU2. The changes included incorporation into the selected remedy the activities necessary to facilitate Woodside 1 and Woodside 2 dam removal and subsequent stream corridor restoration.
- This SRI is being conducted by Schlumberger to address questions posed by the public to USEPA regarding residual PCB concentrations and residual risk in the project reach.

1.2 Objective

The objective of this SRI is to evaluate residual PCB concentrations in the dredged portion of the project reach of Twelvemile Creek. A second objective is to evaluate the residual health risk to recreational users of the project reach.

Data quality objectives (DQOs) were developed using the USEPA 7-step process (USEPA 2006) to address the environmental questions identified. The following are the DQOs that were developed:

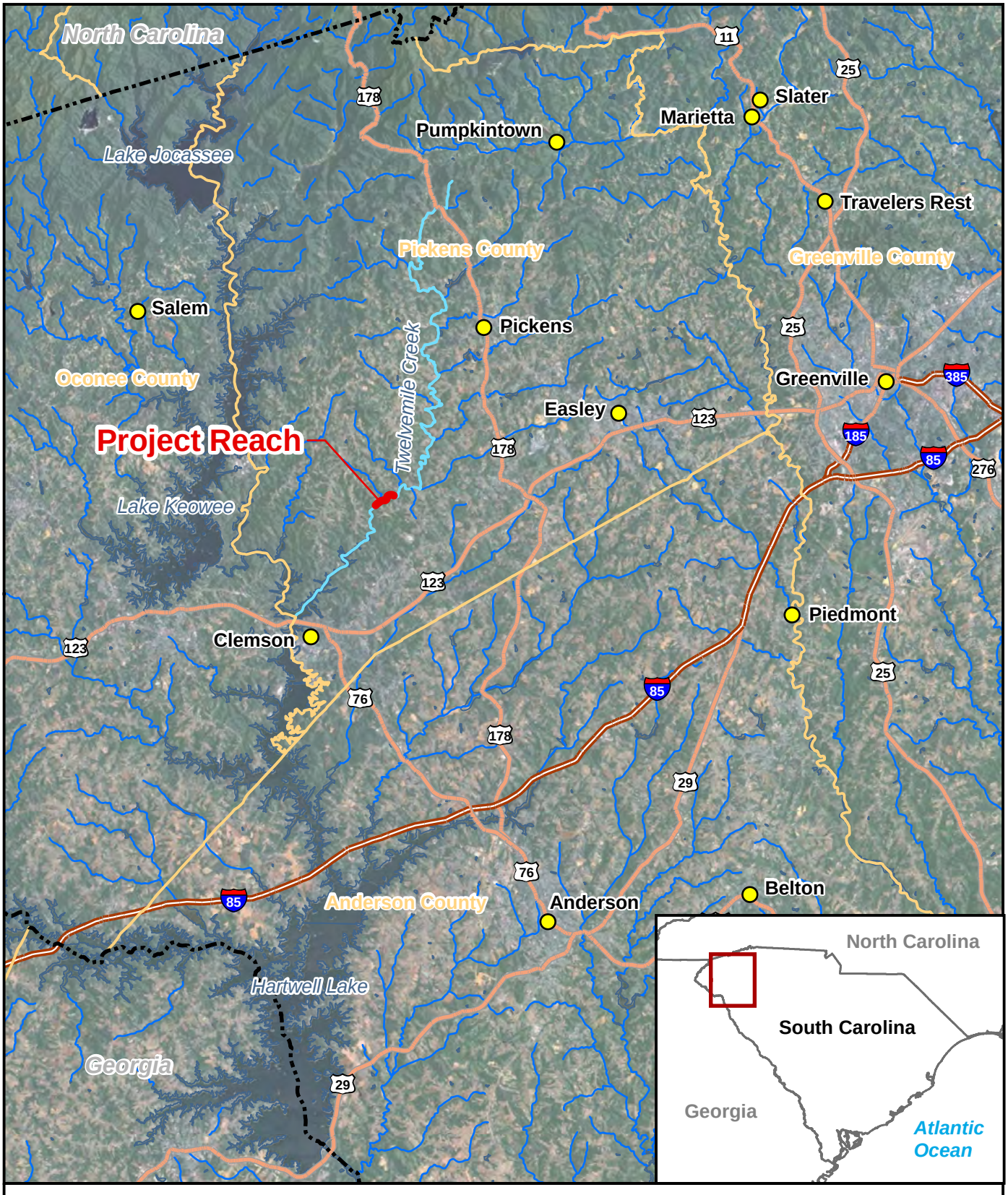
- Do residual sediments and sorbed PCBs pose a potential human health risk above USEPA target levels (1×10^{-4} excess lifetime cancer risk [ELCR] and noncancer hazard index of 1) under current and reasonably foreseeable future use scenarios? To evaluate this DQO, submerged sediment samples from the current creek

and incremental samples from sandbars were collected. If risk estimates for recreational users are within USEPA target levels, no further action will be required. If risk estimates for recreational users exceed USEPA target levels, further action will be required.

- What is the estimated residual mass of PCBs remaining within the project reach? To evaluate the DQO, grain size and PCB analyses were performed on samples collected from floodplain and shoaled materials.

1.3 Approach

Activities performed during the SRI were completed in accordance with the *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP QAPP) Site-specific Plans for Operable Unit 2 of the Twelvemile Creek Site, Supplemental Remedial Investigation, Pickens County South Carolina* (CH2M HILL 2012b) and subsequent revised worksheets based on USEPA review comments. Changes to the sampling approach documented in the UFP QAPP based on field conditions and stakeholder input are documented in Section 3.



LEGEND

- State Boundary
- City / Town
- County Boundary
- Interstate
- State Highway
- Stream/River
- Twelvemile Creek

FIGURE 1-1
Regional Location Map and Surface Water Features
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

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FIGURE 1-2
Site Location Map
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

CH2MHILL

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SECTION 2

Background

Section 2 presents an overview of the site background and characteristics of OU2 (as applicable to the project reach shown in Figure 1-2) identified in the OU2 RI (Bechtel 1993). The information in the following paragraphs constitutes the conceptual site model (CSM) for the SRI project reach.

2.1 Site Background

Sangamo Weston, Inc., manufactured electrolytic mica and power factor capacitors at the Pickens, South Carolina, plant from 1955 to 1978. The plant used a variety of dielectric fluids in the manufacturing processes, including fluids that contained PCBs. The PCBs used for this application were primarily Aroclors 1242, 1254, and 1016. Waste disposal practices included land burial of off-specification capacitors and wastewater treatment sludge on the plant site and in six satellite disposal areas. In addition, PCBs were discharged with wastewater treatment effluent directly into Town Creek, a tributary of Twelvemile Creek, which is a major tributary of Lake Hartwell (USEPA 2004).

According to the OU2 RI report (Bechtel 1993) the average quantity of PCBs received and used at the plant ranged from 700,000 to 2,000,000 pounds per year between 1955 and 1977. The report estimated 3 percent of the quantities received and used at the plant may have been discharged to Town Creek, resulting in an estimated cumulative discharge of over 400,000 pounds of PCBs over the operating life of the plant. A fish consumption advisory for Lake Hartwell was first instituted in 1976 (USEPA 2004). The PCB use was terminated at the plant in 1977, prior to a USEPA ban of its use in January 1978.

The site was proposed to the NPL in January 1987, and was listed on the NPL in February 1990. The site was divided into two OUs. OU1 addressed the land-based source areas, which comprised the plant site and six satellite disposal areas. OU2 addressed the sediment and surface water migration pathways downstream from the source areas. Remedial action construction was completed for OU1 in August 1999. In general, the cleanup activities at OU1 involved excavation of PCB-impacted material at the Sangamo Plant and the satellite disposal areas followed by thermal desorption on the plant property. Approximately 60,000 tons (that is, 40,000 cubic yards) of PCB-impacted material was treated by thermal desorption on the plant property from December 1995 through May 1997. Active groundwater recovery and treatment for PCBs and some volatile organics continue at the plant site and one satellite disposal area known as the Breazeale property (USEPA 2004).

The party responsible to USEPA for the site is Schlumberger Technology Corporation of Houston, Texas, as a result of a merger with Sangamo Weston in 1989. Schlumberger performed the remedial action at OU1, pursuant to the terms of a Consent Decree with USEPA. USEPA conducted a Fund-lead RI/FS for OU2 from September 1990 through April 1994 (USEPA 2004).

A comprehensive discussion and presentation of the OU2 RI/FS findings and conclusions can be found in the RI/FS documents and the ROD (USEPA 1994). The following are the major components of the remedy selected for OU2 in the ROD and implemented by Schlumberger through a September 1998 Unilateral Administrative Order:

- Continuation of the existing fish consumption advisory on Lake Hartwell
- Public education program designed to increase awareness of the advisory and methods to prepare/cook fish to reduce the quantity of contaminants consumed
- Continued monitoring of aquatic biota and sediment to support continuance and/or justify modifications to existing fish advisory
- Regulation of Twelvemile Creek impoundments to facilitate burial of contaminated sediment while mitigating adverse impacts to Lake Hartwell water quality (USEPA 1994)

In May 2006, state and federal natural resource trustees reached a natural resource damage settlement agreement with Schlumberger through a Consent Decree entered in federal court. The settlement required restoration and compensation for alleged injuries to natural resources due to PCB exposure and for alleged lost recreational fishing use due to fish consumption advisories. Restoration included the removal of the lower two hydroelectric impoundments on Twelvemile Creek, known as Woodside 1 and Woodside 2 dams, and stream corridor restoration. In September 2009, USEPA prepared an Explanation of Significant Differences to document a significant change to the ROD (USEPA 2009).

Between March 2010 and September 2011, sediment dredging and the removal of Woodside 1 and Woodside 2 dams (Figure 1-2) were completed as part of stream restoration activities in accordance with the Consent Decree and the Explanation of Significant Differences. Sediment removal activities at the Woodside 1 impoundment (Station 0+00 to Woodside 1 dam at approximately Station 15+00) began in March 2010 and were completed in March 2011. Sediment removal activities at the Woodside 2 impoundment (Station 25+00 to Woodside 2 dam at approximately Station 68+00) were completed in July 2011. Removal of the Woodside 1 dam was performed in February and March 2011. Removal of the Woodside 2 dam began in July 2011 and was completed in September 2011 (ARCADIS 2012). Over 400,000 cubic yards of sediment were removed and placed in the Sediment Management Unit for Twelvemile Creek.

2.2 Physical Characteristics

The Twelvemile Creek watershed has an area of 140 square miles and includes first-, second-, third-, and fourth-order streams. The tributaries to Twelvemile Creek are predominantly first- and second-order streams. Twelvemile Creek, the longest stream segment in the watershed, flows southward for approximately 24 miles until reaching the headwaters of Hartwell Lake. Within this 24-mile reach, approximately 80 tributaries flow into Twelvemile Creek.

Flow data for Twelvemile Creek indicate an average daily flow of 198 cubic feet per second (ft^3/s), with historical daily flow ranging from 30 to 5,360 ft^3/s. Sediment in the creek is composed primarily of sand and has generally low total organic carbon content that ranges from 0.1 to 3.6 percent. National Pollutant Discharge Elimination System (NPDES) permit data indicate that Twelvemile Creek receives discharges from sewage treatment plants and a small number of industrial facilities. The discharges average 1 to 2 million gallons per day (1.5 to 3.0 ft^3/s). During low-flow periods, the permitted discharges may comprise 10 to 13 percent of the flow of the creek. During normal flow, the discharges comprise less than 2 percent of the flow and become negligible during high-flow periods (USEPA 1994).

2.3 Previous Investigations

Sampling activities have been conducted in the Twelvemile Creek watershed and Hartwell Lake since 1976. The sampling has included surface sediment, sediment core, surface water, and fish sampling (Bechtel 1993).

Field investigation activities for the Twelvemile Creek OU2 RI were conducted in two seasonal sampling events. The Phase I event was conducted during July and August 1991. The objectives of Phase I were to verify the extent of contamination determined from previous investigations and to further characterize the magnitude and distribution of PCBs in the Twelvemile Creek watershed and Lake Hartwell. Results of Phase I sampling were used to define a focused sampling program for the Phase II sampling event. Phase II was conducted during April and May 1992. The objective of Phase II was to address specific data gaps regarding the extent of PCBs in sediments of the upper Lake Hartwell (that is, Seneca River, Keowee River, and Twelvemile Creek Arms) and the Twelvemile Creek watershed (USEPA 1994).

Previous investigations and the Twelvemile Creek OU2 RI have delineated the distribution and magnitude of PCBs in sediment in OU2 prior to the restoration project. Most of the impacted sediment lies within the upper portion of Lake Hartwell, specifically the Twelvemile Creek Arm and Seneca River Arm opposite the City of Clemson. Within the Twelvemile Creek watershed, minor levels of PCB contamination have persisted in Town Creek near the Sangamo Weston plant site and in the impoundments associated with the three small dams on Twelvemile

Creek, two of which are shown in Figure 1-2 (USEPA 1994). The third dam, Easley Central, is upstream of the project reach.

During the OU2 RI, the area was subdivided into different areas. The project reach is located within the section identified as the lower section of the Twelvemile Creek watershed. The sampling in the area was completed immediately upstream of the dams. The objective of the sampling was to determine whether sediment containing PCBs was continuing to accumulate behind the structures. The sampling also sought to confirm whether the periodic flushing of sediments from the impoundment areas had effectively removed the mass of PCB-contaminated sediment. Two sediment core samples were collected within each of the three impoundments to investigate the presence of PCBs at depth. In addition to the core samples, surface grab sampling was completed (Bechtel 1993).

The OU2 RI included both field screening (Spittler Method) and fixed-base laboratory analyses (Contract Laboratory Program [CLP]). Although the statistical correlation between the methods was not strong, the results appear similar. The sampling completed in the area during the RI had detected concentrations of total PCBs ranging from 0.01J to 3.58 milligrams per kilogram (mg/kg) (detected in a surface grab sample). Historical sampling results from the area had total PCB detections up to 13.2 mg/kg in shallow sediment (0- to 5-centimeter section of a core sample).

2.4 Potential Receptors and Exposure Pathways

A site reconnaissance was performed on October 11 and 12, 2011, by the agencies (USEPA, U.S. Army Corps of Engineers [USACE], and the South Carolina Department of Health and Environmental Control [SCDHEC]) and Schlumberger to identify realistic exposure scenarios, appropriate exposure areas and depths, and realistic current receptors. The current and reasonably foreseeable future land use addressed in the HHRA is recreational use. The potential human receptors evaluated for sediment exposures are kayakers/boaters (adults and adolescents [ages 6 to 16] and waders/sunbathers (adults and children [ages 0 to 6]). Incidental ingestion and dermal contact with sediments were evaluated for both receptors. The exposure frequencies and durations were based on a reasonable maximum exposure (RME) scenario. The exposure frequency was based on periods when outside temperature is 70 degrees or above, it is not raining, and it is the weekend. Local climate data were used to identify the parameters. The USACE provided the number of days per year when the water was deep enough (at least 1 foot) for kayaking.

For this project, the term areas of interest (AOIs) is used to define specific sediment accumulation areas for sampling that could potentially be used for recreational purposes. The following four AOIs were initially identified by the USEPA, SCDHEC, USACE, and Schlumberger during the site reconnaissance on October 12, 2011: Shoaling Area—Station 42+00 downstream to 48+00, Shoaling Area—Station 42+00 upstream to 27+00, Ball's Beach, and Woodside 1 Sandbar. During review of the UFP QAPP, USEPA requested the removal of the Shoaling Areas from the AOIs and the inclusion of Boy Scout Beach and Cateechee Beach. The AOIs sampled are presented in Figure 1-2.

Since PCBs are adsorbed to sediment and not dissolved in the water column, if PCBs are present in surface water within the study area, they are present as a result of sediment suspended in water. Therefore, only sediments were sampled.

A risk assessment was prepared as part of the OU2 RI report (Bechtel 1993) for the site, and resulted in ongoing annual fish sampling in downstream Lake Hartwell. This risk assessment included an evaluation of ecological risks. USEPA Office of Research and Development is currently conducting additional ecological assessment work that will be submitted by USEPA in a separate document.

SECTION 3

Supplemental Remedial Investigation Activities

SRI field activities at Twelvemile Creek were performed between October 2011 and May 2012. The purpose of the field investigation was to collect data to address the DQOs presented in Section 1. The field investigation consisted of site reconnaissance activities, sampling AOIs using incremental sampling techniques, submerged sediment sampling, and soil profile sampling along the sidewalls of Twelvemile Creek. Field sampling activities were performed in general accordance with the UFP QAPP. Appendix A contains photographs of the field investigation activities.

3.1 Site Reconnaissance

On October 11 and 12, 2011, a scoping session and site visit were held, which included representatives of Schlumberger, CH2M HILL, USEPA, SCDHEC, and USACE. During the meeting, DQOs were discussed along with data needs and sampling plan assumptions. During the site visit conducted on October 12, 2011, four AOIs (Ball's Beach, Boy Scout Beach, Woodside 1 Sandbar, and Cateechee Beach) were identified for the HHRA, and proposed sampling locations and quantities for the HHRA and mass estimate were agreed upon by the attendees. Worksheet #9 of the UFP QAPP includes detailed meeting minutes of the meetings and site visits.

3.2 Submerged Sediment Sampling

Fourteen submerged sediment samples were collected within the project reach (Figure 3-1). Proposed sample locations were revised based on field conditions (physical access and presence of sediment) and USEPA comments during the sampling event. Four additional submerged sediment samples were collected at the request of USEPA. Sample locations presented in Figure 3-1 are approximate and were determined in the field by noting station location stakes because the handheld global positioning system (GPS) unit was unable to receive a signal to provide location information.

Sediment was collected from 0 to 6 inches below the water/sediment interface using a clean 1-inch stainless steel tube that was pushed into the sediment surface. Sediment from the 0- to 6-inch interval was placed in laboratory-supplied containers for analysis of seven PCB Aroclors. Sampling began at the furthest downstream sample location and proceeded upstream to prevent disturbance or influence of unsampled areas, as accessibility permitted. Descriptions of the sediment were made using visual-manual procedures for each location.

3.3 Incremental Sampling

A total of six incremental samples were collected within the four AOIs (Ball's Beach, Boy Scout Beach, Woodside 1 Sandbar, and Cateechee Beach) identified within the project reach (Figure 3-2). Proposed AOIs were revised based on field conditions and USEPA comments. Locations presented in Figure 3-2 are approximate and were determined in the field by noting station location stakes because the handheld GPS unit was unable to receive a signal to provide location information.

Incremental samples were collected within the sampling units using a systematic sampling pattern with a random starting point. The number of increments for each sampling unit was 30, with the exception of TMC-DU01, which had 68 increments. During sampling activities, the areas of each sampling unit were determined with the appropriate sample spacing between each increment. Samples were collected by walking from one corner of the grid systematically back and forth across the entire gridded area, collecting an increment of sediment within each marked segment of the grid. Increments were collected from the 0- to 6-inch interval using a clean 1-inch sand/sludge sediment probe. While walking the sampling unit grid, increments were stored in clean stainless steel bowls, and then placed in laboratory-supplied containers for processing and analysis of seven PCB Aroclors.

3.4 Soil Profile Sampling

Soil profile sampling of the flood plain sidewalls was completed at 18 sidewall locations along the sides of Twelvemile Creek in the project reach (Figure 3-3) with a total of 179 soil samples collected. Proposed sample locations were revised based on field conditions and USEPA comments. Upon arrival at the first sampling station, USEPA requested that the entire face starting at the former sediment surface (prior to the dredging) down to the creek water level be sampled at 2-foot intervals instead of 2-foot samples over 8 feet as proposed in the UFP QAPP. Two proposed sample locations near Station 14+00, designated as SB11 and SB12, were not sampled due to the presence of erosion control netting (SB11) and the lack of soil/sediment at the rock outcrop (SB12). The number of samples increased from the proposed 109 to 179. Sample locations presented in Figure 3-3 are approximate and were determined in the field by noting station location stakes because the handheld GPS unit was unable to receive a signal to provide location information.

Sampling began at the highest point of observed residual sediment that remained following the dredging event and proceeded at 2-foot intervals down to the water surface. The total thickness of sampled sediment ranged from 11 to 31 feet. One discrete sample was collected at each sampling station that was biased toward fine-grained and/or dark material (potentially higher organic carbon content). A clean shovel was used at each profile location to expose a clean face of the sidewall. Soil collected from each 2-foot interval using a clean trowel was placed in a clean stainless steel bowl, homogenized, and placed in laboratory-supplied containers for analysis of seven PCB Aroclors.

In addition to the seven PCB Aroclor analyses, bulk density and grain size analysis was completed for each representative soil type identified during the soil profile sampling. Samples for analysis of bulk density were collected using a sand sludge sediment probe with a plastic liner. A minimum 6-inch length of liner was filled with soil. The excess liner was removed and capped at each end.

Lithologic logs and profile sketches were prepared at each location using visual manual procedures (Appendix B).

3.5 Sample Analysis

Submerged sediment, incremental sediment samples, and soil profile samples collected during field activities were submitted for laboratory analysis. Submerged sediment samples and soil profile samples were sent to TestAmerica–Chicago for analysis of seven PCB Aroclors (Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260; method SW-846 8082A). Select soil profile samples were sent to TestAmerica-Burlington for analysis of grain size (sieve-only, no hydrometer; method American Society for Testing and Materials [ASTM] D422) and in-place density (method ASTM D2937). Incremental samples were sent to TestAmerica-Sacramento for processing using procedures similar to those for Method SW-846 8330B prior to analysis of seven PCB Aroclors at TestAmerica–Chicago.

TestAmerica–Chicago maintains National Environmental Laboratory Accreditation Program (NELAP) accreditation through Illinois and is certified as an environmental laboratory through South Carolina.

Results were reported in Level IV data packages, which are the most comprehensive possible for the analytical method.

3.6 Quality Assurance/Quality Control Sampling

Field quality assurance (QA)/quality control (QC) samples were collected according to the following frequencies:

- Field Duplicate—One field duplicate was collected per 10 field samples per matrix for discrete samples.
- Field Triplicate—One field triplicate was collected per 10 field samples for incremental samples.
- Matrix spike (MS)/matrix spike duplicate (MSD) —One MS/MSD pair was collected per 20 field samples per matrix.
- Equipment blank—One equipment rinsate blank was collected per day per equipment type when equipment was decontaminated.

- Field blanks—One ambient field blank was collected per week of sampling.
- All QA/QC samples were analyzed for seven PCB Aroclors. Field QA/QC samples are not required for grain size or in-place density.

3.7 Data Quality Assessment

CH2M HILL performed data review, verification, and validation of the sample data as specified by the work plan, and assessed the quality of the analytical result. The following areas were reviewed:

- Case narrative to identify issues that the laboratory reported in the data deliverable
- Sample integrity (sample collection, preservation, and holding times)
- Basic QC measurements used to assess the accuracy, precision, and representativeness of data, including blanks, laboratory control samples, MS/MSDs, internal standard and surrogate recoveries when applicable, and field or laboratory replicate results
- Sample results, target compound lists, and detection limits to verify that project analytical requirements are met
- Initial and continuing calibration data
- Precision between the two columns or detectors for methods that employ second column/detector confirmation
- Initiation of corrective actions, as necessary, based on the data review findings

To reflect QC exceedances, data were qualified using appropriate qualifier flags. A J-qualifier was used to designate a detected concentration that may be estimated. A U-qualifier was used to indicate that the analyte was nondetect or not detected at significantly greater than that in an associated blank. A UJ-qualifier was used to indicate that the analyte was nondetect, but the reporting limit is estimated. The data validation report documents the data review, verification, and validation efforts performed on these data sets. The data validation report is provided in Appendix C. Analytical data is provided in Appendix D. Results of the data validation suggest that, in general, the QA/QC goals have been met and the data are acceptable for decision making as qualified.

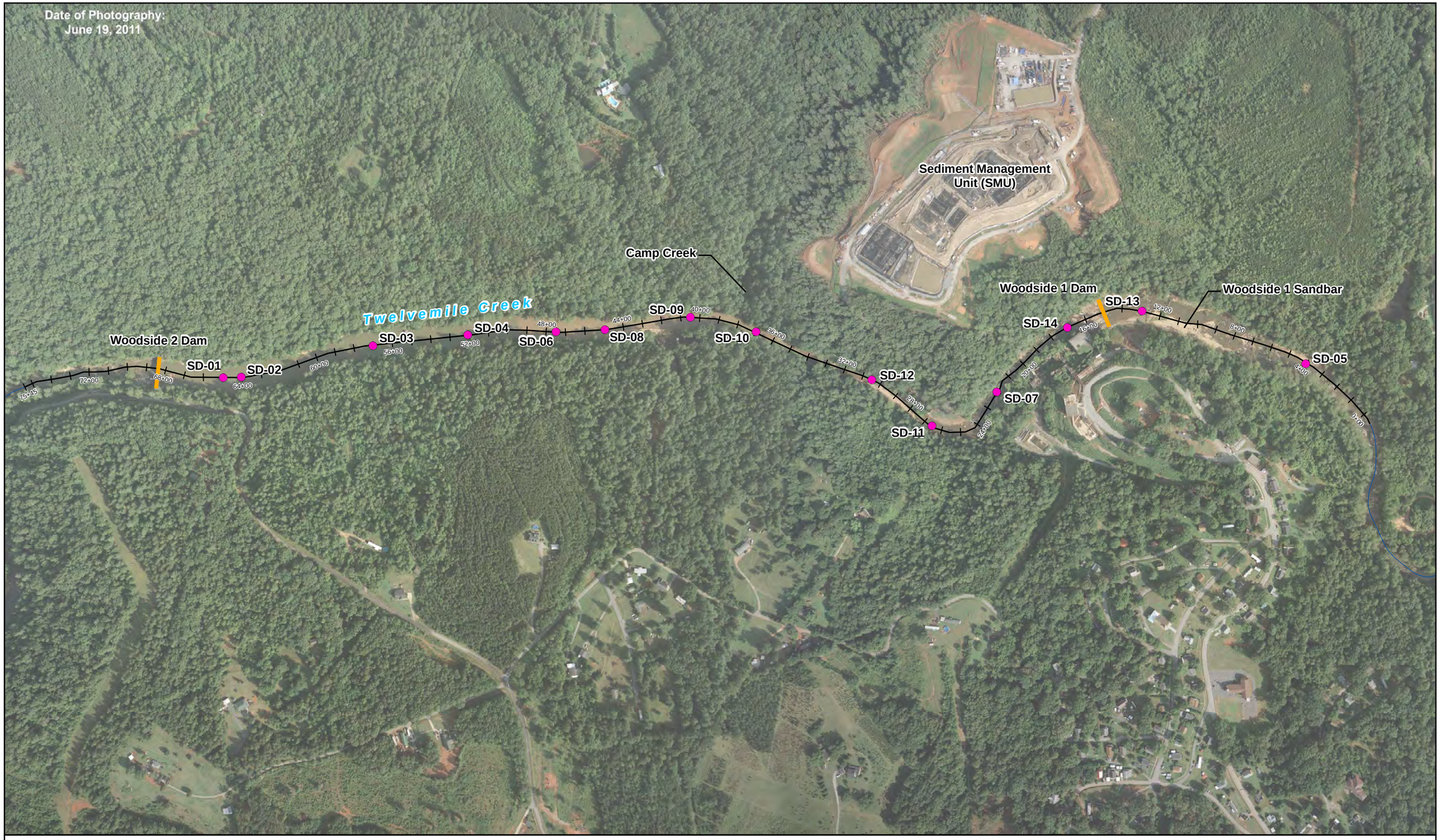
TABLE 3-1

Submerged Sediment Sample - Sediment Descriptions

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Location	Station	Sediment Description
SD01	65+00	SAND (SW), tan, saturated, fine to coarse grain with mica
SD02	64+00	SAND (SW), tan, saturated, fine to coarse grain with mica
SD03	57+00	SAND (SW), tan, saturated, fine to coarse grain with mica
SD04	52+00	SAND (SW), tan, saturated, fine to coarse grain with mica
SD05	4+00	SILTY SAND (SM) with organics, tan to black, saturated, fine to coarse grained sand, loose silt, non-plastic, non-cohesive, with mica
SD06	47+50	SAND (SW), tan, saturated, fine to coarse grain with mica
SD07	22+00	SAND (SW), tan, saturated, fine to coarse grain with mica and darker sand (fine) on bottom
SD08	45+00	SAND (SW), tan, saturated, fine to coarse grain with mica
SD09	40+50	SAND (SW), tan, saturated, fine to coarse grain with mica
SD10	37+00	SAND (SW), tan, saturated, fine to coarse grain with mica
SD11	26+50	SAND (SW), tan, saturated, fine to coarse grain with gravel
SD12	30+50	SAND (SW), tan, saturated, fine to coarse grain with gravel
SD13	13+00	SAND (SW), tan, saturated, fine to coarse grain with gravel
SD14	17+00	SAND (SW), tan, saturated, fine to coarse grain with gravel



0 250 500 Feet

LEGEND

- Approximate Creek Centerline and Stationing
- Former Dam
- Submerged Sediment Sample Location

Notes:

1. Sample locations are approximate and were determined in the field by noting station location stakes. All locations are within +/-10 feet of the stated stake location. Due to the high sidewalls of the creek the handheld GPS unit was unable to receive signal to provide location information.
2. Sample locations were revised based on field conditions and USEPA comments.

FIGURE 3-1
Submerged Sediment Sample Locations
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

CH2MHILL

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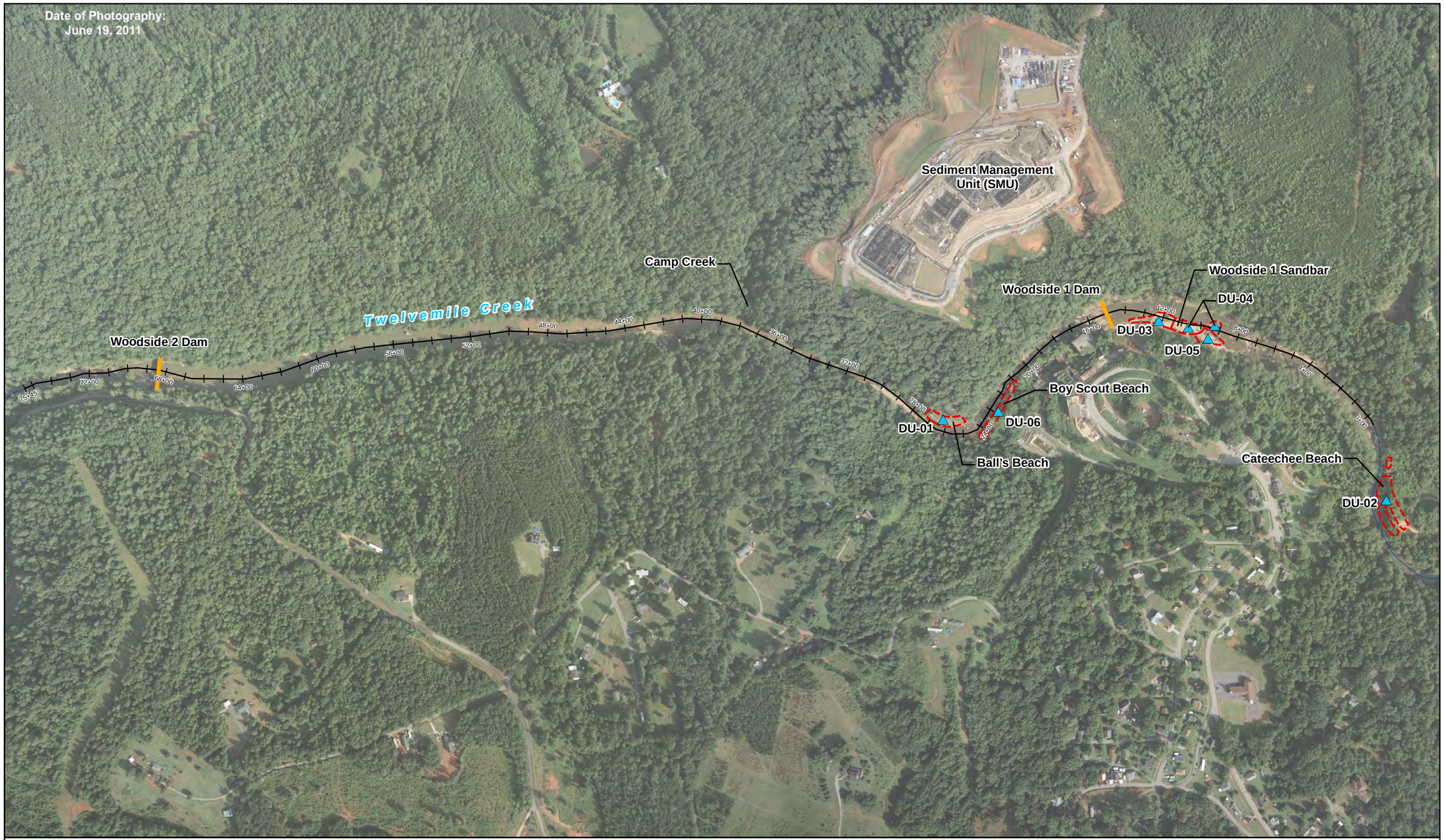


0 250 500 Feet

LEGEND

- Approximate Creek Centerline and Stationing
- Former Dam
- Approximate Extent of Areas of Interest
- Sediment Sample Location by Incremental Sampling

Notes:

1. Sample locations are approximate and were determined in the field by noting station location stakes. All locations are within +/-10 feet of the stated stake location. Due to the high sidewalls of the creek the handheld GPS unit was unable to receive signal to provide location information.
2. Sample locations were revised based on field conditions and USEPA comments.

FIGURE 3-2
Incremental Sample Locations
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

CH2MHILL

RDD \\BALDUR\PROJ\TWELVEMILE_CREEK_428280\MAPFILES\SRI\FIG3-2_MI_SAMP_LOCS_SRI.MXD MSCHROCK 8/14/2012 7:36:09 PM

0 250 500 Feet

LEGEND

- Approximate Creek Centerline and Stationing
- Former Dam
- Creek Sidewall Profile Sample Location

Notes:

1. Sample locations are approximate and were determined in the field by noting station location stakes. All locations are within +/-10 feet of the stated stake location. Due to the high sidewalls of the creek the handheld GPS unit was unable to receive signal to provide location information.
2. Sample location SB11 could not be sampled due to construction repairs and the presence of erosion control netting. Also, location SB12 could not be sampled due to the absence of soil/sediment at the rock outcrop. The omission of these sample locations was approved in the field by USEPA representatives.

FIGURE 3-3
Soil Profile Sample Locations
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

CH2MHILL

RDD \\BALDUR\PROJ\TWELVEMILE_CREEK_428280\MAPFILES\SRI\FIG3-3_SOIL_PROFILE_SAMP_LOCS_SRI.MXD MSCHROCK 8/15/2012 7:31:39 AM

SECTION 4

Nature and Extent of PCB-impacted Sediment

This section discusses the nature and extent of PCBs observed in the project reach of Twelvemile Creek. Appendix D contains the analytical data from the SRI.

4.1 Submerged Sediment Samples

Submerged sediment samples were collected from fourteen locations within the project reach for analysis of seven PCB Aroclors. PCB-1248 and 1254 were detected in these samples. Figure 4-1 and Table 4-1 present detections of these chemicals in at least one sample; therefore, some nondetect values are included. PCB-1248 was detected in 6 of the 14 samples at concentrations ranging from 0.029J mg/kg in SD13 to 0.33J mg/kg in SD03. PCB-1254 was detected in 11 of the 14 samples at concentrations ranging from 0.0065J mg/kg in SD12 to 0.21J mg/kg in SD03. The quantitative analysis of risk does not use nondetect values (U and UJ qualified data).

4.2 Incremental Samples

Six incremental samples were collected within four AOIs within the project reach and analyzed for seven PCB Aroclors. PCB-1248 and 1254 were detected in these samples. Figure 4-2 and Table 4-2 present detections of these chemicals in at least one sample; therefore, some nondetect values are included. PCB-1248 was detected in all six incremental samples at concentrations ranging from 0.023J mg/kg in DU02 to 0.14J mg/kg in DU01. PCB-1254 was detected in all six samples at concentrations ranging from 0.026J mg/kg in DU02 to 0.14J mg/kg in DU01. The quantitative analysis of risk does not use nondetect values (U and UJ qualified data).

4.3 Soil Profile Samples

Soil profile samples were collected from 18 locations within the project reach and analyzed for seven PCB Aroclors. PCB-1248, 1254, and 1260 were detected in these samples. Figure 4-3 and Table 4-3 present detections of these. PCB-1248 was detected in samples collected from each of the 18 sample locations at concentrations ranging from 0.021J mg/kg in the 10- to 12-foot interval of SB14 to 16 mg/kg in the 4- to 6-foot interval of SB17. PCB-1254 was detected in samples collected from each of the 18 sample locations at concentrations ranging from 0.0086J mg/kg in the 16- to 18-foot interval of SB13 to 14 mg/kg in the 4- to 6-foot interval of SB17. PCB-1260 was detected in samples collected from two of the 18 locations at concentrations ranging from 0.38J mg/kg in the 12- to 14-foot interval of SB16 to 52 mg/kg in the 10- to 12-foot interval of SB15. PCB-1260 was not listed in the Aroclors used at the Sangamo Weston facility (Bechtel 1993) and may represent contamination from another source.

4.4 Nature and Extent Summary

PCB Aroclors were detected in submerged sediment samples, incremental sediment samples, and soil profile samples collected within the project reach. PCB-1248 and 1254 were detected in samples from all 3 sample types, and PCB-1260 was only detected in 2 of the 18 soil profile locations.

Detected concentrations of PCB-1248 and 1254 in the submerged sediment and incremental samples are low. Concentrations of PCBs in the sediments are lower than surface sediment samples collected during RI activities prior to dredging.

Concentrations of PCB-1248 and 1254 in the soil profile samples were detected within the project reach. The highest concentrations of Aroclor-1248 and Aroclor-1254 were detected in locations SB16, SB17, and SB19, which are located upstream of former Woodside 1 dam. Concentrations of PCB-1260 were only detected in locations SB15 and SB16, which are locations opposite of each other and located upstream of former Woodside 1 dam. The concentrations of PCB-1260 were relatively low (less than 1 mg/kg), with the exception of one detection at 52 mg/kg from the 10- to 12-foot interval of SB15. According to Bechtel, PCB-1260 was not used at the Sangamo Weston facility (Bechtel 1993).

TABLE 4-1
PCBs Detected in Submerged Sediment Samples
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site,
Pickens County, South Carolina

Location	SD01		SD02		SD03		SD04		SD05	SD06	SD07	
Sample ID	TMC-SD01-0001	TMC-SDP01-0001	TMC-SD02-0001	TMC-SDP02-0001	TMC-SD03-0001	TMC-SDP03-0001	TMC-SD04-0001	TMC-SDP04-0001	TMC-SD05-0001	TMC-SD06-0001	TMC-SD07-0001	TMC-SDP07-0001
Sample Date	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012
Sample Depth (ft)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Sample Type	N	FD	N	FD	N	FD	N	FD	N	N	N	FD
Analyte (mg/kg)												
PCB-1248	**0.035 J**	**0.064**	0.011 U	0.011 U	**0.16 J**	**0.33 J**	0.01 U	0.01 U	0.011 U	0.011 U	0.011 U	**0.24**
PCB-1254	**0.058**	**0.037 J**	**0.022 J**	**0.038 J**	**0.1 J**	**0.21 J**	**0.01 J**	**0.011 J**	0.011 U	**0.014 J**	**0.086 J**	**0.16 J**

Notes:
N = native sample
FD = field duplicate sample
J = Estimated.
U = Nondetect or not detected at significantly greater than that in an associated blank.
UJ = Nondetect. Estimated reporting limit.
mg/kg = milligrams per kilogram
Bold indicates the analyte was detected

TABLE 4-1
PCBs Detected in Submerged Sediment Samples
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site,
Pickens County, South Carolina

Location	SD08	SD09	SD10	SD11	SD12	SD13	SD14
Sample ID	TMC-SD08-0001	TMC-SD09-0001	TMC-SD10-0001	TMC-SD11-0001	TMC-SD12-0001	TMC-SD13-0001	TMC-SD14-0001
Sample Date	05/01/2012	05/01/2012	05/01/2012	05/02/2012	05/02/2012	05/02/2012	05/02/2012
Sample Depth (ft)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Sample Type	N	N	N	N	N	N	N
Analyte (mg/kg)							
PCB-1248	**0.061**	**0.1**	0.0098 UJ	0.011 U	0.01 U	**0.029 J**	0.0097 U
PCB-1254	**0.054**	**0.089**	0.0098 UJ	0.011 U	**0.0065 J**	**0.037 J**	**0.0082 J**

Notes:
N = native sample
FD = field duplicate sample
J = Estimated.
U = Nondetect or not detected at significantly greater than that in an associated blank.
UJ = Nondetect. Estimated reporting limit.
mg/kg = milligrams per kilogram
Bold indicates the analyte was detected

TABLE 4-2

PCBs Detected in Incremental Samples

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Location	DU01		DU02	DU03		DU04		DU05	DU06
Sample ID	TMC-DU01	TMC-DU01 DUP	TMC-DU02	TMC-DU03	TMC-DU04	TMC-DU04-T	TMC-DU04-TT	TMC-DU05	TMC-DU06-050112
Sample Date	04/26/2012	04/26/2012	04/26/2012	04/27/2012	04/27/2012	04/27/2012	04/27/2012	04/27/2012	05/01/2012
Sample Depth (ft)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Sample Type	N	FD	N	N	N	FD	FD	N	N
Analyte (mg/kg)									
PCB-1248	**0.13 J**	**0.14 J**	**0.023 J**	**0.048 J**	**0.037 J**	**0.052 J**	**0.026 J**	**0.054 J**	**0.071 J**
PCB-1254	**0.13 J**	**0.14 J**	**0.026 J**	**0.04 J**	**0.033 J**	**0.041 J**	**0.027 J**	**0.046 J**	**0.05 J**

Notes:

N = native sample

FD = field duplicate sample

J = Estimated.

mg/kg = milligrams per kilogram

Bold indicates the analyte was detected

TABLE 4-3

PCBs Detected in Soil Profile Samples

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)		
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1248**	**PCB-1254**	**PCB-1260**
SB01	TMC-SB01-0002	0 - 2	04/17/2012	N	0.0089 U	**0.25**	0.0089 U
	TMC-SB01P-0002	0 - 2	04/17/2012	FD	0.023 U	**0.35**	0.023 U
	TMC-SB01-0204	2 - 4	04/17/2012	N	0.046 U	**0.55**	0.046 U
	TMC-SB01-0406	4 - 6	04/17/2012	N	0.053 U	**0.54**	0.053 U
	TMC-SB01-0608	6 - 8	04/17/2012	N	0.061 U	**0.65**	0.061 U
	TMC-SB01-0810	8 - 10	04/17/2012	N	0.057 U	**0.68**	0.057 U
	TMC-SB01-1012	10 - 12	04/17/2012	N	**1 J**	**0.63 J**	0.1 U
	TMC-SB01-1214	12 - 14	04/17/2012	N	0.0086 U	**0.021 J**	0.0086 U
	TMC-SB01-1416	14 - 16	04/17/2012	N	**0.34**	**0.28**	0.0092 U
	TMC-SB01-1618	16 - 18	04/17/2012	N	**0.96 J**	**0.61 J**	0.1 U
	TMC-SB01-1717.5-D	17 - 17.5 (D)	04/17/2012	N	**4.4**	**2.8**	0.27 U
	TMC-SB01-1820	18 - 20	04/17/2012	N	**0.13**	**0.076**	0.011 U
	TMC-SB01-2022	20 - 22	04/17/2012	N	**0.52 J**	**0.31 J**	0.094 U
	TMC-SB01-2224	22 - 24	04/17/2012	N	**1.8**	**1.2**	0.23 U
SB02	TMC-SB02-0002	0 - 2	04/17/2012	N	**0.5**	**0.61**	0.097 U
	TMC-SB02-0204	2 - 4	04/17/2012	N	**0.7**	**0.64**	0.1 U
	TMC-SB02-0406	4 - 6	04/17/2012	N	**0.034**	**0.018 J**	0.0083 U
	TMC-SB02-0608	6 - 8	04/17/2012	N	**0.21**	**0.12**	0.0092 U
	TMC-SB02-0810	8 - 10	04/17/2012	N	**0.9**	**0.5**	0.098 U
	TMC-SB02-1012	10 - 12	04/17/2012	N	0.27 U	**5.1**	0.27 U
	TMC-SB02-1214	12 - 14	04/17/2012	N	**2.4**	**1.6**	0.12 U
	TMC-SB02-12.513-D	12.5 - 13 (D)	04/17/2012	N	**3.1**	**2**	0.13 U
	TMC-SB02-1416	14 - 16	04/17/2012	N	**3.6**	**2.2**	0.14 U
	TMC-SB02-1618	16 - 18	04/17/2012	N	0.13 U	**2.3 J**	0.13 U
SB03	TMC-SB03-0002	0 - 2	04/17/2012	N	0.048 U	**0.61**	0.048 U
	TMC-SB03-0204	2 - 4	04/17/2012	N	0.052 U	**0.92**	0.052 U
	TMC-SB03-0406	4 - 6	04/17/2012	N	**1.2**	**0.89**	0.049 U
	TMC-SB03-0608	6 - 8	04/17/2012	N	**0.18**	**0.11**	0.0092 U
	TMC-SB03-0810	8 - 10	04/17/2012	N	0.22 U	0.22 U	0.22 U
	TMC-SB03-0995-D	9 - 9.5 (D)	04/17/2012	N	0.7 U	0.7 U	0.7 U
	TMC-SB03-1012	10 - 12	04/17/2012	N	0.018 U	0.018 U	0.018 U
	TMC-SB03-1214	12 - 14	04/17/2012	N	0.25 U	**2.9**	0.25 U
	TMC-SB03-1416	14 - 16	04/17/2012	N	0.11 U	**0.64 J**	0.11 U
	TMC-SB04-0002	0 - 2	04/24/2012	N	0.05 U	**0.62**	0.05 U
	TMC-SB04P-0002	0 - 2	04/24/2012	FD	**0.38**	**0.56**	0.019 U
	TMC-SB04-0204	2 - 4	04/24/2012	N	**0.5**	**0.6**	0.048 U
	TMC-SB04-0406	4 - 6	04/24/2012	N	**3.4 J**	**2.6 J**	0.12 U

TABLE 4-3

PCBs Detected in Soil Profile Samples

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)		
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1248**	**PCB-1254**	**PCB-1260**
SB04	TMC-SB04-0608	6 - 8	04/24/2012	N	**2 J**	**1.6 J**	0.12 U
	TMC-SB04-0810	8 - 10	04/24/2012	N	**0.82**	**0.53**	0.052 U
	TMC-SB04-1012	10 - 12	04/24/2012	N	**0.22**	**0.13**	0.0084 U
	TMC-SB04-1212.4-D	12 - 12.4 (D)	04/24/2012	N	0.011 UJ	0.011 UJ	0.011 UJ
	TMC-SB04-1214	12 - 14	04/24/2012	N	**0.12**	**0.057**	0.0098 U
	TMC-SB04-1416	14 - 16	04/24/2012	N	0.0095 U	0.0095 U	0.0095 U
	TMC-SB04-1618	16 - 18	04/24/2012	N	0.0094 U	**0.019 J**	0.0094 U
	TMC-SB04-1819	18 - 19	04/24/2012	N	0.084 U	**0.31 J**	0.084 U
	TMC-SB04-2224	22 - 24	04/24/2012	N	0.011 U	0.011 U	0.011 U
SB05	TMC-SB05-0002	0 - 2	04/19/2012	N	0.0093 U	**0.17**	0.0093 U
	TMC-SB05P-0002	0 - 2	04/19/2012	FD	0.0092 U	**0.21**	0.0092 U
	TMC-SB05-0204	2 - 4	04/19/2012	N	0.01 U	**0.36**	0.01 U
	TMC-SB05-0406	4 - 6	04/19/2012	N	0.023 U	**0.57**	0.023 U
	TMC-SB05-0608	6 - 8	04/19/2012	N	**0.88 J**	**0.61 J**	0.05 U
	TMC-SB05-0810	8 - 10	04/19/2012	N	**0.8 J**	**0.45 J**	0.049 U
	TMC-SB05-09.510-D	9.5 - 10 (D)	04/19/2012	N	**0.72 J**	**0.44 J**	0.026 UJ
	TMC-SB05-1012	10 - 12	04/19/2012	N	**0.87 J**	**0.53 J**	0.054 U
SB06	TMC-SB06-0002	0 - 2	04/24/2012	N	0.0099 U	**0.35**	0.0099 U
	TMC-SB06P-0002	0 - 2	04/24/2012	FD	0.0096 U	**0.3**	0.0096 U
	TMC-SB06-0204	2 - 4	04/24/2012	N	0.049 U	**0.75**	0.049 U
	TMC-SB06-0406	4 - 6	04/24/2012	N	0.095 U	**1.5 J**	0.095 U
	TMC-SB06-0607	6 - 7	04/24/2012	N	**2.4**	**2.1**	0.2 U
	TMC-SB06-0810	8 - 10	04/24/2012	N	**0.084**	**0.08**	0.0088 U
	TMC-SB06-1012	10 - 12	04/24/2012	N	**1.9 J**	**1.1 J**	0.12 U
	TMC-SB06-1111.5-D	11 - 11.5 (D)	04/24/2012	N	**2.3 J**	**1.1 J**	0.072 UJ
SB07	TMC-SB07-0002	0 - 2	04/19/2012	N	**4.3**	**6.2**	0.93 U
	TMC-SB07P-0002	0 - 2	04/19/2012	FD	**4.7**	**6.7**	0.96 U
	TMC-SB07-0204	2 - 4	04/19/2012	N	**2.3**	**4.1**	0.2 U
	TMC-SB07-0406	4 - 6	04/19/2012	N	**0.81**	**1.4**	0.047 U
	TMC-SB07-0608	6 - 8	04/19/2012	N	0.0093 U	**0.19**	0.0093 U
	TMC-SB07-0810	8 - 10	04/19/2012	N	**1.8 J**	**1.2 J**	0.12 U
	TMC-SB07-09.510-D	9.5 - 10 (D)	04/19/2012	N	**1.8 J**	**1.1 J**	0.069 U
	TMC-SB07-1011	10 - 11	04/19/2012	N	**0.64**	**0.36**	0.023 U
	TMC-SB08-0002	0 - 2	04/20/2012	N	0.0092 U	**0.22**	0.0092 U
	TMC-SB08-0204	2 - 4	04/20/2012	N	0.048 U	**1.3**	0.048 U
	TMC-SB08-0406	4 - 6	04/20/2012	N	0.0094 U	**0.18**	0.0094 U
	TMC-SB08-0608	6 - 8	04/20/2012	N	0.019 U	**0.43**	0.019 U

TABLE 4-3

PCBs Detected in Soil Profile Samples

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)		
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1248**	**PCB-1254**	**PCB-1260**
SB08	TMC-SB08-0810	8 - 10	04/20/2012	N	0.019 U	**0.56**	0.019 U
	TMC-SB08-1012	10 - 12	04/20/2012	N	**0.35**	**0.25**	0.02 U
	TMC-SB08-1111.5-D	11 - 11.5 (D)	04/20/2012	N	**0.18**	**0.14**	0.0097 U
	TMC-SB08-1214	12 - 14	04/20/2012	N	**0.13**	**0.14**	0.0096 U
	TMC-SB08-1415	14 - 15	04/20/2012	N	**0.3**	**0.25**	0.011 U
SB09	TMC-SB09-0002	0 - 2	04/19/2012	N	**0.76**	**0.77**	0.047 U
	TMC-SB09D-0002	0 - 2	04/19/2012	FD	**1.2**	**1.2**	0.05 U
	TMC-SB09-0204	2 - 4	04/19/2012	N	**3.3**	**2**	0.09 U
	TMC-SB09-0406	4 - 6	04/19/2012	N	**0.11 J**	**0.092 J**	0.0097 UJ
	TMC-SB09-0608	6 - 8	04/19/2012	N	**1.1 J**	**0.73 J**	0.046 U
	TMC-SB09-0810	8 - 10	04/19/2012	N	**0.25**	**0.17**	0.0096 U
	TMC-SB09-1010.5-D	10 - 10.5 (D)	04/19/2012	N	**1.3 J**	**0.69 J**	0.05 U
	TMC-SB09-1012	10 - 12	04/19/2012	N	**0.54 J**	**0.3 J**	0.02 U
SB10	TMC-SB10-0002	0 - 2	04/20/2012	N	0.018 U	**0.38**	0.018 U
	TMC-SB10-0204	2 - 4	04/20/2012	N	0.0089 U	**0.29**	0.0089 U
	TMC-SB10-0406	4 - 6	04/20/2012	N	0.051 U	**0.83**	0.051 U
	TMC-SB10-0608	6 - 8	04/20/2012	N	0.047 U	**0.48**	0.047 U
	TMC-SB10-0810	8 - 10	04/20/2012	N	**0.31 J**	**0.24 J**	0.0091 U
	TMC-SB10-1010.5-D	10 - 10.5 (D)	04/20/2012	N	**2.3 J**	**1.5 J**	0.12 U
	TMC-SB10-1012	10 - 12	04/20/2012	N	**2.1 J**	**1.2 J**	0.12 U
SB13	TMC-SB13-0002	0 - 2	04/19/2012	N	0.01 U	**0.27 J**	0.01 U
	TMC-SB13P-0002	0 - 2	04/19/2012	FD	**1.5**	**1.9 J**	0.049 U
	TMC-SB13-0204	2 - 4	04/19/2012	N	**3.3**	**3.3**	0.2 U
	TMC-SB13-0406	4 - 6	04/19/2012	N	**2.4 J**	**2.4 J**	0.1 U
	TMC-SB13-0608	6 - 8	04/19/2012	N	**0.4**	**0.33**	0.012 U
	TMC-SB13-0810	8 - 10	04/19/2012	N	**0.47 J**	**0.35 J**	0.012 UJ
	TMC-SB13-1012	10 - 12	04/19/2012	N	**0.11**	**0.1**	0.01 U
	TMC-SB13-1212.5-D	12 - 12.5 (D)	04/19/2012	N	**0.078**	**0.062**	0.011 U
	TMC-SB13-1416	14 - 16	04/19/2012	N	**2.4 J**	**1.4 J**	0.14 U
	TMC-SB13-1618	16 - 18	04/19/2012	N	0.0085 U	**0.0086 J**	0.0085 U
	TMC-SB13-1820	18 - 20	04/19/2012	N	**0.25**	**0.13**	0.0089 U
	TMC-SB13-19.520-D	19.5 - 20 (D)	04/19/2012	N	**0.54**	**0.31**	0.028 U
	TMC-SB14-0002	0 - 2	04/25/2012	N	0.02 U	**0.48**	0.02 U
	TMC-SB14P-0002	0 - 2	04/25/2012	FD	0.02 U	**0.47**	0.02 U
	TMC-SB14-0204	2 - 4	04/25/2012	N	**2**	**2.4**	0.17 U
	TMC-SB14-0406	4 - 6	04/25/2012	N	**0.025 J**	**0.045 J**	0.0084 UJ
	TMC-SB14-0608	6 - 8	04/25/2012	N	**0.014 J**	**0.028 J**	0.0084 U

TABLE 4-3

PCBs Detected in Soil Profile Samples

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)		
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1248**	**PCB-1254**	**PCB-1260**
SB14	TMC-SB14-0810	8 - 10	04/25/2012	N	**0.017 J**	**0.034 J**	0.0086 UJ
	TMC-SB14-1012	10 - 12	04/25/2012	N	**0.021 J**	**0.045 J**	0.0085 UJ
	TMC-SB14-1214	12 - 14	04/25/2012	N	**0.022 J**	**0.038 J**	0.0085 UJ
	TMC-SB14-1416	14 - 16	04/25/2012	N	**0.045 J**	**0.05 J**	0.0082 UJ
	TMC-SB14-1618	16 - 18	04/25/2012	N	**0.58**	**0.4**	0.043 U
	TMC-SB14-1820	18 - 20	04/25/2012	N	**0.65**	**0.49**	0.048 U
	TMC-SB14-2020.5-D	20 - 20.5 (D)	04/25/2012	N	**1.9 J**	**1.7 J**	0.12 U
	TMC-SB14-2022	20 - 22	04/25/2012	N	**0.89**	**0.91**	0.052 U
	TMC-SB14P-2022	20 - 22	04/25/2012	FD	**0.83**	**0.87**	0.053 U
	TMC-SB14-2224	22 - 24	04/25/2012	N	**0.19**	**0.24**	0.0094 U
	TMC-SB14-2426	24 - 26	04/25/2012	N	**0.11**	**0.17**	0.0091 U
	TMC-SB14-2628	26 - 28	04/25/2012	N	**0.78 J**	**0.68 J**	0.048 U
	TMC-SB14-2830	28 - 30	04/25/2012	N	**3.8**	**2.8**	0.22 U
	TMC-SB14-3031	30 - 31	04/25/2012	N	0.012 U	0.012 U	0.012 U
SB15	TMC-SB15-0002	0 - 2	04/19/2012	N	0.009 U	**0.19**	0.009 U
	TMC-SB15P-0002	0 - 2	04/19/2012	FD	**0.13**	**0.15**	0.009 U
	TMC-SB15-0204	2 - 4	04/19/2012	N	0.0083 U	**0.024 J**	0.0083 U
	TMC-SB15-0406	4 - 6	04/19/2012	N	0.0086 U	**0.023 J**	0.0086 U
	TMC-SB15-0608	6 - 8	04/19/2012	N	0.0084 U	**0.023 J**	0.0084 U
	TMC-SB15-0810	8 - 10	04/19/2012	N	**1.2**	**0.85**	0.067 U
	TMC-SB15-1012	10 - 12	04/19/2012	N	2.6 U	2.6 U	**52**
	TMC-SB15-1214	12 - 14	04/19/2012	N	0.095 U	**1.8 J**	**0.49 J**
	TMC-SB15-1414.5D	14 - 14.5 (D)	04/19/2012	N	**1.2 J**	**1.1 J**	0.057 U
	TMC-SB15-1416	14 - 16	04/19/2012	N	**1.5 J**	**0.81 J**	0.047 U
	TMC-SB15-1618	16 - 18	04/19/2012	N	**0.26**	**0.17**	0.0092 U
	TMC-SB15-1820	18 - 20	04/19/2012	N	**0.13**	**0.099**	0.0086 U
	TMC-SB15-2022	20 - 22	04/19/2012	N	**0.076**	**0.048**	0.0086 U
	TMC-SB15-2224	22 - 24	04/19/2012	N	**0.42**	**0.3**	0.0099 U
SB16	TMC-SB16-0002	0 - 2	04/24/2012	N	**0.3**	**0.43**	0.019 U
	TMC-SB16P-0002	0 - 2	04/24/2012	FD	**0.46**	**0.62**	0.049 U
	TMC-SB16-0204	2 - 4	04/24/2012	N	0.018 U	**0.33**	0.018 U
	TMC-SB16-0406	4 - 6	04/24/2012	N	0.22 U	**8.6**	0.22 U
	TMC-SB16-0608	6 - 8	04/24/2012	N	0.0084 U	**0.02 J**	0.0084 U
	TMC-SB16-0810	8 - 10	04/24/2012	N	0.0087 U	**0.093**	0.0087 U
	TMC-SB16-1012	10 - 12	04/24/2012	N	**3 J**	**2 J**	**0.82 J**
	TMC-SB16-1214	12 - 14	04/24/2012	N	**3.2 J**	**1.6 J**	**0.38 J**
	TMC-SB16-1416	14 - 16	04/24/2012	N	0.1 U	**1.2 J**	**0.52 J**

TABLE 4-3

PCBs Detected in Soil Profile Samples

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)		
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1248**	**PCB-1254**	**PCB-1260**
SB17	TMC-SB16-14.515-D	14.5 - 15 (D)	04/24/2012	N	**9.6**	**5.1**	0.28 U
	TMC-SB16-1618	16 - 18	04/24/2012	N	0.0089 UJ	0.0089 UJ	0.0089 UJ
	TMC-SB16-1820	18 - 20	04/24/2012	N	**0.25**	**0.16**	0.0094 U
	TMC-SB16-2021	20 - 21	04/24/2012	N	**0.023 J**	**0.015 J**	0.0097 U
	TMC-SB17-0002	0 - 2	04/25/2012	N	**1.3**	**1.4**	0.094 U
	TMC-SB17P-0002	0 - 2	04/25/2012	FD	**1.6**	**1.9**	0.19 U
	TMC-SB17-0204	2 - 4	04/25/2012	N	**5.1**	**5.8**	0.18 U
	TMC-SB17-0406	4 - 6	04/25/2012	N	**16**	**14**	1 U
	TMC-SB17-0608	6 - 8	04/25/2012	N	**2.8**	**2.9**	0.09 U
	TMC-SB17-0810	8 - 10	04/25/2012	N	**1.7**	**1.9**	0.089 U
	TMC-SB17-1012	10 - 12	04/25/2012	N	**1.7**	**1.8**	0.093 U
	TMC-SB17-1214	12 - 14	04/25/2012	N	**3.6 J**	**3.1 J**	0.096 U
	TMC-SB17-1416	14 - 16	04/25/2012	N	**0.9**	**0.9**	0.091 U
	TMC-SB17-1618	16 - 18	04/25/2012	N	**0.36**	**0.39**	0.02 U
	TMC-SB17-1717.5-D	17 - 17.5 (D)	04/25/2012	N	**0.27**	**0.45**	0.022 U
	TMC-SB17-1820	18 - 20	04/25/2012	N	0.2 U	**1.2**	0.2 U
SB18	TMC-SB18-0002	0 - 2	04/25/2012	N	0.0089 U	**0.15**	0.0089 U
	TMC-SB18P-0002	0 - 2	04/25/2012	FD	0.0089 U	**0.14**	0.0089 U
	TMC-SB18-0204	2 - 4	04/25/2012	N	**0.32**	**0.46**	0.02 U
	TMC-SB18-0406	4 - 6	04/25/2012	N	0.0096 U	**0.32**	0.0096 U
	TMC-SB18-0608	6 - 8	04/25/2012	N	**0.17**	**0.17**	0.011 U
	TMC-SB18-0810	8 - 10	04/25/2012	N	**0.4**	**0.34**	0.011 U
	TMC-SB18-1012	10 - 12	04/25/2012	N	**0.13**	**0.095**	0.0097 U
	TMC-SB18-1214	12 - 14	04/25/2012	N	0.19 U	**2.9**	0.19 U
	TMC-SB18-1313.5-D	13 - 13.5 (D)	04/25/2012	N	**1.6 J**	**1.8 J**	0.058 U
	TMC-SB18-1416	14 - 16	04/25/2012	N	**0.5**	**0.47**	0.021 U
	TMC-SB18-1618	16 - 18	04/25/2012	N	**0.3**	**0.24**	0.0098 U
	TMC-SB18P-1618	16 - 18	04/25/2012	FD	**0.33**	**0.23**	0.01 U
	TMC-SB18-1819	18 - 19	04/25/2012	N	0.01 U	0.01 U	0.01 U
SB19	TMC-SB19-0002	0 - 2	04/25/2012	N	0.009 U	**0.22**	0.009 U
	TMC-SB19P-0002	0 - 2	04/25/2012	FD	0.0099 U	**0.2**	0.0099 U
	TMC-SB19-011.5-D	1 - 1.5 (D)	04/25/2012	N	**0.27 J**	**0.4**	0.018 U
	TMC-SB19-0204	2 - 4	04/25/2012	N	**0.1**	**0.18**	0.0097 U
	TMC-SB19-0406	4 - 6	04/25/2012	N	**3.1**	**3.2**	0.18 U
	TMC-SB19-0608	6 - 8	04/25/2012	N	**13**	**11**	0.99 U
	TMC-SB19-0810	8 - 10	04/25/2012	N	**5.4**	**3.3 J**	0.96 U
	TMC-SB19-1012	10 - 12	04/25/2012	N	**0.66**	**0.81**	0.092 U

TABLE 4-3

PCBs Detected in Soil Profile Samples

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)		
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1248**	**PCB-1254**	**PCB-1260**
	TMC-SB19-1214	12 - 14	04/25/2012	N	**0.72 J**	**0.98 J**	0.11 U
	TMC-SB19-1416	14 - 16	04/25/2012	N	**0.43**	**0.51**	0.022 U
	TMC-SB19-1617	16 - 17	04/25/2012	N	**0.31**	**0.33**	0.011 U
SB20	TMC-SB20-0002	0 - 2	04/25/2012	N	**0.09**	**0.17**	0.0087 U
	TMC-SB20P-0002	0 - 2	04/25/2012	FD	**0.068**	**0.12**	0.0084 U
	TMC-SB20-0204	2 - 4	04/25/2012	N	**0.078**	**0.13**	0.0088 U
	TMC-SB20-0406	4 - 6	04/25/2012	N	**0.15**	**0.19**	0.0089 U
	TMC-SB20-0608	6 - 8	04/25/2012	N	**0.14**	**0.14**	0.01 U
	TMC-SB20-0810	8 - 10	04/25/2012	N	**0.14**	**0.16**	0.0095 U
	TMC-SB20-9.510-D	9.5 - 10 (D)	04/25/2012	N	**0.51**	**0.46**	0.021 U

Notes:

N = native sample

FD = field duplicate sample

J = Estimated.

U = Nondetect or not detected at significantly greater than that in an associated blank.

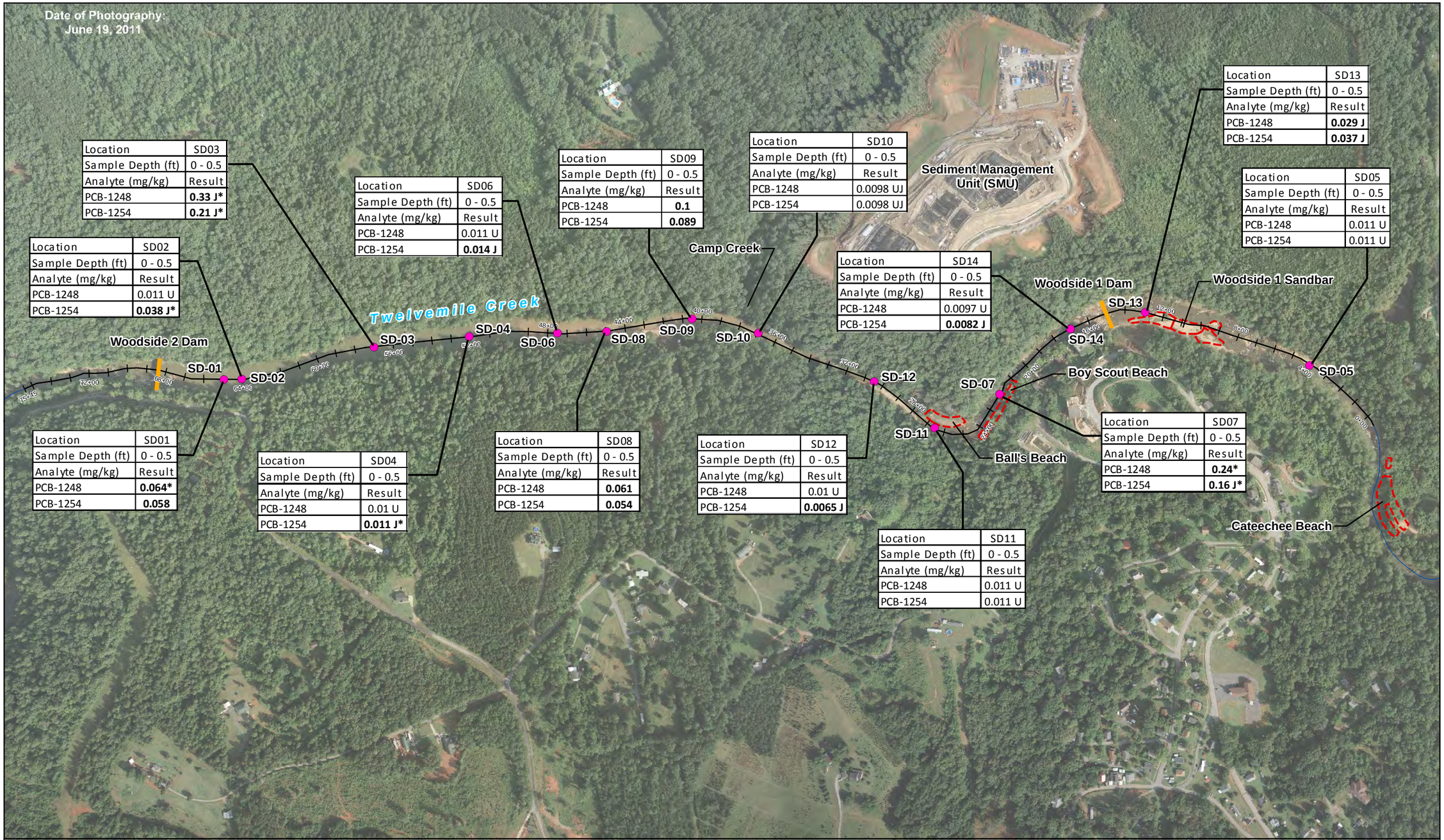
UJ = Nondetect. Estimated reporting limit.

mg/kg = milligrams per kilogram

Bold indicates the analyte was detected

(D) = Discrete sample collected in dark organic layers observed.

Sample location SB 11 could not be sampled due to construction repairs and the presence of erosion control netting. Also, location SB12 could not be sampled due to the absence of soil/sediment at the rock outcrop. The omission of these sample locations was approved in the field by USEPA representatives.



0 250 500 Feet

LEGEND

- Approximate Creek Centerline and Stationing
- Former Dam
- Approximate Extent of Areas of Interest
- Submerged Sediment Sample Location

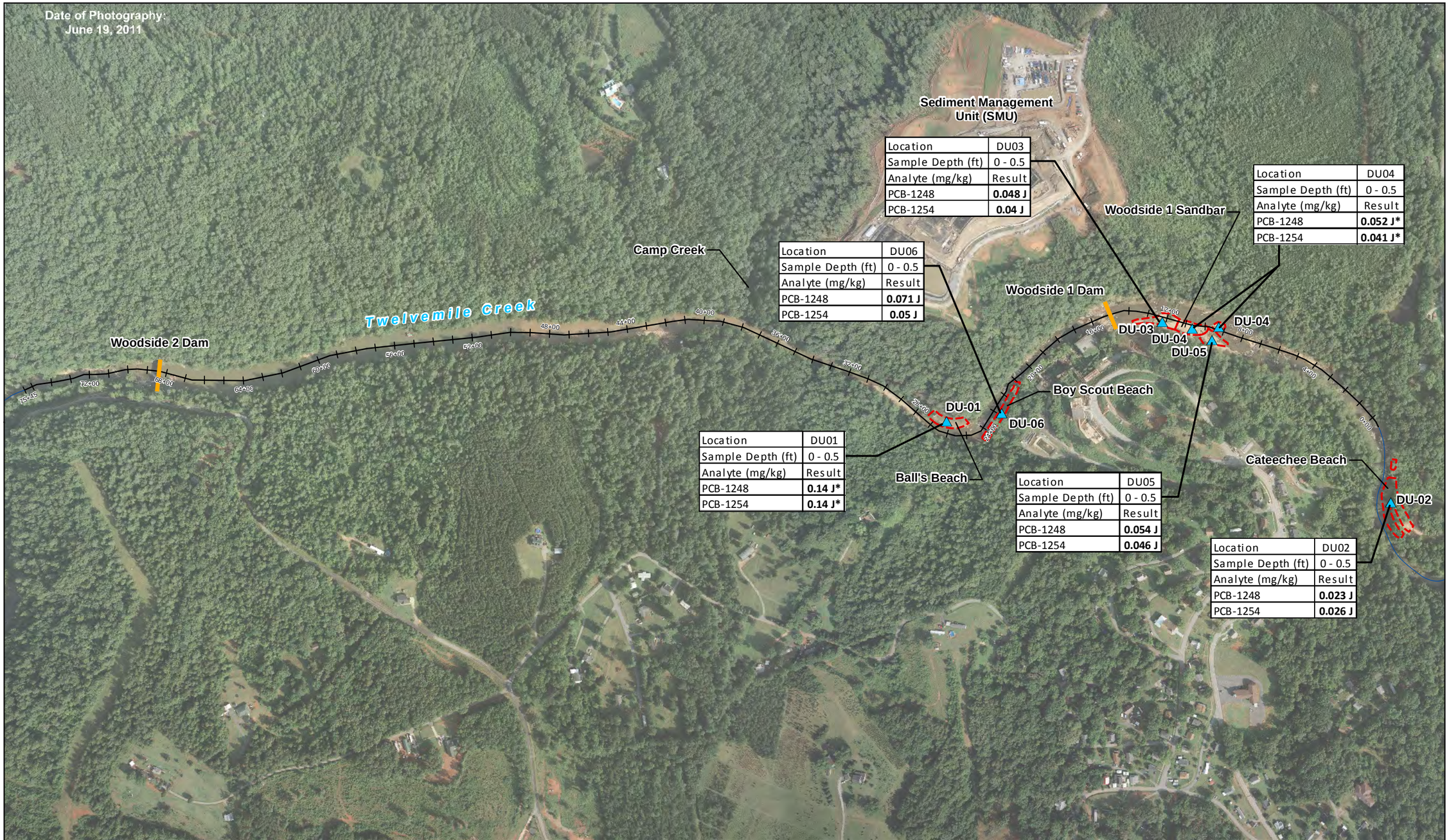
Notes:

1. Sample locations are approximate and were determined in the field by noting station location stakes. All locations are within +/-10 feet of the stated stake location. Due to the high sidewalls of the creek the handheld GPS unit was unable to receive signal to provide location information.
2. Sample locations were revised based on field conditions and USEPA comments.
3. J = Estimated.
4. U = Nondetect or not detected at significantly greater than that in an associated blank.
5. UJ = Nondetect. Estimated reporting limit.
6. mg/kg = micrograms per kilogram
7. **Bold** indicates the analyte was detected.
8. PCB = polychlorinated biphenyl
9. * = Result presented is field duplicate result, which is higher than the native sample result.

FIGURE 4-1
PCBs Detected in Submerged Sediment Samples
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

CH2MHILL

RDD \\BALDUR\PROJ\TWELVEMILE_CREEK_428280\MAPFILES\SRI\FIG4-1_SUB_SEDIMENT_DETECTS_SRI.MXD MSCHROCK 8/14/2012 7:49:40 PM



Notes:

1. Sample locations are approximate and were determined in the field by noting station location stakes. All locations are within +/-10 feet of the stated stake location. Due to the high sidewalls of the creek the handheld GPS unit was unable to receive signal to provide location information.
2. Sample locations were revised based on field conditions and USEPA comments.
3. J = Estimated.
4. mg/kg = micrograms per kilogram
5. **Bold** indicates the analyte was detected.
6. PCB = polychlorinated biphenyl
7. * = Result presented is field duplicate or triplicate result, which is higher than the native sample result.

FIGURE 4-2
PCBs Detected in Incremental Samples
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

CH2MHILL

RDD \\BALDUR\PROJ\TWELVEMILE_CREEK_428280\MAPFILES\SRI\FIG4-2_MIS_DETECTS_SRI.MXD MSCHROCK 8/14/2012 7:55:40 PM

Date of Photography:
June 19, 2011

Location	SB04		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**0.38***	**0.62**	0.05 U
2 - 4	**0.5**	**0.6**	0.048 U
4 - 6	**3.4 J**	**2.6 J**	0.12 U
6 - 8	**2 J**	**1.6 J**	0.12 U
8 - 10	**0.82**	**0.53**	0.052 U
10 - 12	**0.22**	**0.13**	0.0084 U
12 - 12.4 (D)	0.011 UJ	0.011 UJ	0.011 UJ
12 - 14	**0.12**	**0.057**	0.0098 U
14 - 16	0.0095 U	0.0095 U	0.0095 U
16 - 18	0.0094 U	**0.019 J**	0.0094 U
18 - 19	0.084 U	**0.31 J**	0.084 U
22 - 24	0.011 U	0.011 U	0.011 U

Location	SB06		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.0099 U	**0.35**	0.0099 U
2 - 4	0.049 U	**0.75**	0.049 U
4 - 6	0.095 U	**1.5 J**	0.095 U
6 - 7	**2.4**	**2.1**	0.2 U
8 - 10	**0.084**	**0.08**	0.0088 U
10 - 12	**1.9 J**	**1.1 J**	0.12 U
11 - 11.5 (D)	**2.3 J**	**1.1 J**	0.072 UJ

Location	SB08		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.0092 U	**0.22**	0.0092 U
2 - 4	0.048 U	**1.3**	0.048 U
4 - 6	0.0094 U	**0.18**	0.0094 U
6 - 8	0.019 U	**0.43**	0.019 U
8 - 10	0.019 U	**0.56**	0.019 U
10 - 12	**0.35**	**0.25**	0.02 U
11 - 11.5 (D)	**0.18**	**0.14**	0.0097 U
12 - 14	**0.13**	**0.14**	0.0096 U
14 - 15	**0.3**	**0.25**	0.011 U

Location	SB10		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.018 U	**0.38**	0.018 U
2 - 4	0.0089 U	**0.29**	0.0089 U
4 - 6	0.051 U	**0.83**	0.051 U
6 - 8	0.047 U	**0.48**	0.047 U
8 - 10	**0.31 J**	**0.24 J**	0.0091 U
10 - 10.5 (D)	**2.3 J**	**1.5 J**	0.12 U
10 - 12	**2.1 J**	**1.2 J**	0.12 U

Location	SB14		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.02 U	**0.48**	0.02 U
2 - 4	**2**	**2.4**	0.17 U
4 - 6	**0.025 J**	**0.045 J**	0.0084 UJ
6 - 8	**0.014 J**	**0.028 J**	0.0084 U
8 - 10	**0.017 J**	**0.034 J**	0.0086 UJ
10 - 12	**0.021 J**	**0.045 J**	0.0085 UJ
12 - 14	**0.022 J**	**0.038 J**	0.0085 UJ
14 - 16	**0.045 J**	**0.05 J**	0.0082 UJ
16 - 18	**0.58**	**0.4**	0.043 U
18 - 20	**0.65**	**0.49**	0.048 U
20 - 20.5 (D)	**1.9 J**	**1.7 J**	0.12 U
20 - 22	**0.89**	**0.91**	0.052 U
22 - 24	**0.19**	**0.24**	0.0094 U
24 - 26	**0.11**	**0.17**	0.0091 U
26 - 28	**0.78 J**	**0.68 J**	0.048 U
28 - 30	**3.8**	**2.8**	0.22 U
30 - 31	0.012 U	0.012 U	0.012 U

Location	SB16		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**0.46***	**0.62***	0.019 U
2 - 4	0.018 U	**0.33**	0.018 U
4 - 6	0.22 U	**8.6**	0.22 U
6 - 8	0.0084 U	**0.02 J**	0.0084 U
8 - 10	0.0087 U	**0.093**	0.0087 U
10 - 12	**3 J**	**2 J**	**0.82 J**
12 - 14	**3.2 J**	**1.6 J**	**0.38 J**
14 - 16	0.1 U	**1.2 J**	**0.52 J**
14.5 - 15 (D)	**9.6**	**5.1**	0.28 U
16 - 18	0.0089 UJ	0.0089 UJ	0.0089 UJ
18 - 20	**0.25**	**0.16**	0.0094 U
20 - 21	**0.023 J**	**0.015 J**	0.0097 U

Location	SB18		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.0089 U	**0.15**	0.0089 U
2 - 4	**0.32**	**0.46**	0.02 U
4 - 6	0.0096 U	**0.32**	0.0096 U
6 - 8	**0.17**	**0.17**	0.011 U
8 - 10	**0.4**	**0.34**	0.011 U
10 - 12	**0.13**	**0.095**	0.0097 U
12 - 14	0.19 U	**2.9**	0.19 U
13 - 13.5 (D)	**1.6 J**	**1.8 J**	0.058 U
14 - 16	**0.5**	**0.47**	0.021 U
16 - 18	**0.33***	**0.24**	0.0098 U
18 - 19	0.01 U	0.01 U	0.01 U

Location	SB02		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**0.5**	**0.61**	0.097 U
2 - 4	**0.7**	**0.64**	0.1 U
4 - 6	**0.034**	**0.018 J**	0.0083 U
6 - 8	**0.21**	**0.12**	0.0092 U
8 - 10	**0.9**	**0.5**	0.098 U
10 - 12	0.27 U	**5.1**	0.27 U
12 - 14	**2.4**	**1.6**	0.12 U
12.5 - 13 (D)	**3.1**	**2**	0.13 U
14 - 16	**3.6**	**2.2**	0.14 U
16 - 18	0.13 U	**2.3 J**	0.13 U

Location	SB01		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.0089 U	**0.35***	0.0089 U
2 - 4	0.046 U	**0.55**	0.046 U
4 - 6	0.053 U	**0.54**	0.053 U
6 - 8	0.061 U	**0.65**	0.061 U
8 - 10	0.057 U	**0.68**	0.057 U
10 - 12	**1 J**	**0.63 J**	0.1 U
12 - 14	0.0086 U	**0.021 J**	0.0086 U
14 - 16	**0.34**	**0.28**	0.0092 U
16 - 18	**0.96 J**	**0.61 J**	0.1 U
17 - 17.5 (D)	**4.4**	**2.8**	0.27 U
18 - 20	**0.13**	**0.076**	0.011 U
20 - 22	**0.52 J**	**0.31 J**	0.094 U
22 - 24	**1.8**	**1.2**	0.23 U

Location	SB03		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.048 U	**0.61**	0.048 U
2 - 4	0.052 U	**0.92**	0.052 U
4 - 6	**1.2**	**0.89**	0.049 U
6 - 8	**0.18**	**0.11**	0.0092 U
8 - 10	0.22 U	0.22 U	0.22 U
9 - 9.5 (D)	0.7 U	0.7 U	0.7 U
10 - 12	0.018 U	0.018 U	0.018 U
12 - 14	0.25 U	**2.9**	0.25 U
14 - 16	0.11 U	**0.64 J**	0.11 U

Location	SB05		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.0093 U	**0.21***	0.0093 U
2 - 4	0.01 U	**0.36**	0.01 U
4 - 6	0.023 U	**0.57**	0.023 U
6 - 8	**0.88 J**	**0.61 J**	0.05 U
8 - 10	**0.8 J**	**0.45 J**	0.049 U
9.5 - 10 (D)	**0.72 J**	**0.44 J**	0.026 UJ
10 - 12	**0.87 J**	**0.53 J**	0.054 U

Location	SB07		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**4.7***	**6.7***	0.93 U
2 - 4	**2.3**	**4.1**	0.2 U
4 - 6	**0.81**	**1.4**	0.047 U
6 - 8	0.0093 U	**0.19**	0.0093 U
8 - 10	**1.8 J**	**1.2 J**	0.12 U
9.5 - 10 (D)	**1.8 J**	**1.1 J**	0.069 U
10 - 11	**0.64**	**0.36**	0.023 U

Location	SB09		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**1.2***	**1.2***	0.047 U
2 - 4	**3.3**	**2**	0.09 U
4 - 6	**0.11 J**	**0.092 J**	0.0097 UJ
6 - 8	**1.1 J**	**0.73 J**	0.046 U
8 - 10	**0.25**	**0.17**	0.0096 U
10 - 10.5 (D)	**1.3 J**	**0.69 J**	0.05 U
10 - 12	**0.54 J**	**0.3 J**	0.02 U

Location	SB13		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**1.5***	**1.9 J***	0.01 U
2 - 4	**3.3**	**3.3**	0.2 U
4 - 6	**2.4 J**	**2.4 J**	0.1 U
6 - 8	**0.4**	**0.33**	0.012 U
8 - 10	**0.47 J**	**0.35 J**	0.012 UJ
10 - 12	**0.11**	**0.1**	0.01 U
12 - 12.5 (D)	**0.078**	**0.062**	0.011 U
14 - 16	**2.4 J**	**1.4 J**	0.14 U
16 - 18	0.0085 U	**0.0086 J**	0.0085 U
18 - 20	**0.25**	**0.13**	0.0089 U
19.5 - 20 (D)	**0.54**	**0.31**	0.028 U

Location	SB15		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**0.13***	**0.19**	0.009 U
2 - 4	0.0083 U	**0.024 J**	0.0083 U
4 - 6	0.0086 U	**0.023 J**	0.0086 U
6 - 8	0.0084 U	**0.023 J**	0.0084 U
8 - 10	**1.2**	**0.85**	0.067 U
10 - 12	2.6 U	2.6 U	**52**
12 - 14	0.095 U	**1.8 J**	**0.49 J**
14 - 14.5 (D)	**1.2 J**	**1.1 J**	0.057 U
14 - 16	**1.5 J**	**0.81 J**	0.047 U
16 - 18	**0.26**	**0.17**	0.0092 U
18 - 20	**0.13**	**0.099**	0.0086 U
20 - 22	**0.076**	**0.048**	0.0086 U
22 - 24	**0.42**	**0.3**	0.0099 U

Location	SB17		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**1.6***	**1.9***	0.094 U
2 - 4	**5.1**	**5.8**	0.18 U
4 - 6	**16**	**14**	1 U
6 - 8	**2.8**	**2.9**	0.09 U
8 - 10	**1.7**	**1.9**	0.089 U
10 - 12	**1.7**	**1.8**	0.093 U
12 - 14	**3.6 J**	**3.1 J**	0.096 U
14 - 16	**0.9**	**0.9**	0.091 U
16 - 18	**0.36**	**0.39**	0.02 U
17 - 17.5 (D)	**0.27**	**0.45**	0.022 U
18 - 20	0.2 U	**1.2**	0.2 U

Location	SB20		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	**0.09**	**0.17**	0.0087 U
2 - 4	**0.078**	**0.13**	0.0088 U
4 - 6	**0.15**	**0.19**	0.0089 U
6 - 8	**0.14**	**0.14**	0.01 U
8 - 10	**0.14**	**0.16**	0.0095 U
9.5 - 10 (D)	**0.51**	**0.46**	0.021 U

Location	SB19		
Sample Depth (ft)	Analyte (mg/kg)		
	PCB-1248	PCB-1254	PCB-1260
0 - 2	0.009 U	**0.22**	0.009 U
1 - 1.5 (D)	**0.27 J**	**0.4**	0.018 U
2 - 4	**0.1**	**0.18**	0.0097 U
4 - 6	**3.1**	**3.2**	0.18 U
6 - 8	**13**	**11**	0.99 U
8 - 10	**5.4**	**3.3 J**	0.96 U
10 - 12	**0.66**	**0.81**	0.092 U
12 - 14	**0.72 J**	**0.98 J**	0.11 U
14 - 16	**0.43**	**0.51**	0.022 U
16 - 17	**0.31**	**0.33**	0.011 U

Camp Creek

Sediment Management Unit (SMU)

Woodside 1 Dam

Woodside 2 Dam

Twelvemile Creek

SB-01 SB-02 SB-03 SB-04 SB-05 SB-06 SB-07 SB-08 SB-09 SB-10 SB-11 SB-12 SB-13 SB-14 SB-15 SB-16 SB-17 SB-18 SB-19 SB-20

75+45 72+00 68+00 64+00 60+00 56+00 52+00 48+00 44+00 40+00 36+00 32+00 28+00 24+00 20+00 16+00 12+00 8+00 4+00 0+00

0 250 500 Feet

LEGEND

- Approximate Creek Centerline and Stationing
- Former Dam
- Creek Sidewall Profile Sample Location

Notes:

1. Sample locations are approximate and were determined in the field by noting station location stakes. All locations are within +/-10 feet of the stated stake location. Due to the high sidewalls of the creek the handheld GPS unit was unable to receive signal to provide location information.
2. Sample locations were revised based on field conditions and USEPA comments.
3. J = Estimated.
4. U = Nondetect or not detected at significantly greater than that in an associated blank.
5. UJ = Nondetect. Estimated reporting limit.
6. mg/kg = milligrams per kilogram
7. **Bold** indicates the analyte was detected.
8. PCB = polychlorinated biphenyl
9. * = Result presented is field duplicate result, which is higher than the native sample result.
10. (D) = Discrete sample collected in dark organic layers observed.
11. Sample location SB11 could not be sampled due to construction repairs and the presence of erosion control netting. Also, location SB12 could not be sampled due to the absence of soil/sediment at the rock outcrop. The omission of these sample locations was approved in the field by USEPA representatives.

FIGURE 4-3
PCBs Detected in Soil Profile Samples
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

CH2MHILL

RDD \\BALDUR\PROJ\TWELVEMILE_CREEK_428280\MAPFILES\SRI\FIG4-3_SIDEWALL_SOIL_DETECTS_SRI.MXD MSCHROCK 8/15/2012 7:34:04 AM

SECTION 5

Mass Estimate

A calculation was completed in order to estimate the mass of PCB Aroclors remaining within the flood plain of the project reach. These calculations were completed using the analytical data and geotechnical data collected from the 18 soil profile sampling locations within the project reach and field measurements made of the floodplain at the time of the sampling. The data used to estimate mass included the following: (1) physical measurements of the height and top width of the residual sediments on the valley wall, (2) geotechnical data, including grain size and bulk density of representative soil samples, and (3) concentration of PCB Aroclors on the face of the residual sediments. At each station, a high-density sampling approach was used, which consisted of sampling at 2-foot vertical intervals along the entire face of sediment and collecting one discrete sample that was biased towards intervals with potentially higher concentrations (fine-grained layer and/or layers with higher organic carbon content).

Details on the procedures and assumptions used to complete the mass estimate, along with the mass estimate calculations, are provided in Appendix E. The general process for calculation of the remaining PCB mass in the project reach entailed the following steps: (1) calculation of the residual sediment volume on the valley wall, (2) calculation of sediment mass by applying bulk density to the soil types observed during sampling, and (3) calculation of the PCB mass from laboratory analyses that are presented on a dry-weight basis.

The calculations presented in Appendix E indicate that at the time of sampling there was about 3,000,000 cubic feet of sediment on the valley walls over an approximate area of 4.8 to 5.5 acres. Within the residual sediment there may be approximately 468 to 870 pounds of PCB Aroclors within the project reach. The PCB mass is presented as a range of values to illustrate some of the uncertainty in the calculations. The greatest uncertainty resides in the estimation of the dimensions used to calculate sediment volume and extrapolating the dimensions of the sediment volume upstream and downstream between sampling stations. The residual PCB mass of 468 to 870 pounds represents about 0.12 to 0.22 percent of the 400,000 pounds of PCBs estimated to have been discharged to Twelvemile Creek.

SECTION 6

Human Health Risk Assessment

A human health risk assessment (HHRA) was conducted for the project reach of OU2 of Twelvemile Creek. The HHRA evaluated potential health risks from current and future exposure to sediment in the project reach at OU2 to address residual PCB concentrations in sediment. The HHRA was conducted using the approach and assumptions presented in the interim deliverable for the HHRA at OU2 and the draft UFP QAPP (CH2M HILL 2012a; 2012b). The primary guidance documents used in preparation of the HHRA included the USEPA *Risk Assessment Guidance for Superfund (RAGS) Parts A, D, E, and F* (USEPA 1989; 2001; 2004; 2009), *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA 2002), *Supplemental Guidance to RAGS: Region 4 Bulletins* (USEPA 2000), and *Standard Default Exposure Factors* (USEPA 1991). The complete HHRA is presented in Appendix F. Section 6 summarizes the approach and key findings of the HHRA.

6.1 Analytical Data

The analytical data used in the HHRA consist of the sediment data collected during the SRI sampling conducted in April and May 2012. Incremental samples were collected from exposed sediment (at a depth interval of 0 to 6 inches) at four AOIs, and discrete submerged sediment samples were collected from a depth interval of 0 to 6 inches in Twelvemile Creek within the project reach. The incremental samples were collected from four AOIs (Ball's Beach, Boy Scout Beach, Woodside 1 Sandbar, and Cateechee Beach), selected based on their potential for sediment accumulation and for recreational use. Six exposed sediment samples (from the four AOIs) and 14 submerged sediment samples were included in the HHRA.

The sediment data were divided into two sample populations, Exposure Unit 1 and Exposure Unit 2, based on the recreational activities likely to occur at the site. Exposure Unit 1 was used to quantify potential exposures for potential current and future kayakers/ boaters and includes all submerged sediment samples collected within the project reach and exposed sediment samples from the four AOIs. Exposure Unit 2 was used to quantify potential exposures for potential current and future waders/sunbathers and includes submerged sediment samples collected within 100 feet of the four AOIs and exposed sediment samples from the four AOIs.

6.2 Chemicals of Potential Concern

The USEPA Regional Screening Levels (RSLs) (USEPA 2012) were used to screen site data. Because some waders/sunbathers may be children, and due to the lack of sediment screening levels for human health, the residential soil RSLs were used in the chemical of potential concern (COPC) screening process. The RSLs are based on a target excess lifetime cancer risk (ELCR) of 1×10^{-6} and a noncancer hazard quotient (HQ) of 1. The RSLs for noncarcinogenic effects were decreased by a factor of 0.1 to account for cumulative noncancer effects.

The analytes with maximum detected concentrations exceeding the adjusted RSLs were identified as COPCs for sediment. Aroclor-1248, Aroclor-1254, and total PCBs were identified as COPCs in sediment for Exposure Unit 1 and Exposure Unit 2. Potential exposures and risks were quantified for Aroclor-1248 and Aroclor-1254 using the calculated "total PCBs" concentration.

6.3 Exposure Evaluation

In accordance with the Draft UFP QAPP (CH2M HILL 2012b), potential exposures were quantified for current and future kayakers/boaters and waders/sunbathers. The following are the potential exposure pathways quantified for each receptor group:

- **Kayakers/Boaters:** Ingestion, dermal contact, and inhalation exposures to PCBs in exposed and submerged sediment at Exposure Unit 1 were quantified for potential current and future adult and adolescent kayakers/boaters.

- **Waders/Sunbathers:** Ingestion, dermal contact, and inhalation exposures to PCBs in exposed and submerged sediment at Exposure Unit 2 were quantified for potential current and future adult and child waders/sunbathers; although adolescents may also be present, the adult and child risk estimates can be used to conservatively represent potential adolescent risk estimates.

These receptor groups were identified as the likely current and future receptors at the site based on the site reconnaissance performed on October 11 and 12, 2011.

A site-specific sediment exposure frequency was developed for kayakers/boaters based on the average number of days per year when the surface water within the project reach of OU2 in Twelvemile Creek is of sufficient depth (at least 1 foot) for kayaking and boating. Water depths in Twelvemile Creek were established based on channel flow plots generated by USACE for water flow rates of 100, 200, 300, and 500 ft^3/s and the flow-duration curve based on the mean daily discharge at the U.S. Geological Survey Liberty Bridge gauging station. The 100 and 200 ft^3/s flow plots indicated areas containing less than 1 foot of water, while the 300 and 500 ft^3/s flow plots indicated water depths of 1 foot or more within the project reach of OU2. Considering 300 ft^3/s as the minimum flow for kayaking/boating, the flow duration curve indicates that the percentage of water flows equaling or exceeding 300 ft^3/s is about 9 percent, equating to approximately 33 days per year (Attachment F-6 of Appendix F).

A site-specific sediment exposure frequency was calculated for sunbathers/waders based on the assumption that a person would be exposed every weekend (2 days per week) during the months of April through October (months with a mean maximum temperature greater than 70 degrees Fahrenheit [National Climatic Data Center 2010]).

6.4 Risk Estimates

USEPA's target (acceptable) range for ELCR associated with CERCLA sites is 1-in-10,000 (1×10^{-4}) to 1-in-1,000,000 (1×10^{-6}). Similarly, the target (acceptable) noncancer hazard index (HI) is 1 or less per target organ. Risk estimates were calculated for current/future potential receptors and sediment exposure pathways (incidental ingestion, dermal contact, and inhalation) using conservative exposure assumptions. The following are the risk estimates:

- **Kayakers/Boaters (Adult and Adolescent)—Exposure Unit 1**
  - Adult: 4×10^{-8} ELCR and HI less than 1
  - Adolescent: 2×10^{-8} ELCR and HI less than 1
- **Waders/Sunbathers (Adult and Child) —Exposure Unit 2**
  - Adult: 2×10^{-7} ELCR and HI less than 1
  - Child: 1×10^{-7} ELCR and HI less than 1

The estimated ELCRs were lower than the USEPA's acceptable risk range of 1×10^{-6} to 1×10^{-4} and the HIs were less than USEPA's target HI of 1. Therefore, ELCR and noncancer hazard estimates are within USEPA acceptable levels and no chemicals of concern were identified in sediment within the project reach of OU2, based on the risk estimates for the kayaker/boater and wader/sunbather scenarios.

SECTION 7

Summary

This SRI in this project reach of OU2 of Twelvemile Creek was performed to assess whether residual sediments and sorbed PCBs pose a potential human health risk under current and reasonably foreseeable future use scenarios and to estimate the residual mass of PCBs remaining in the floodplain soil of this project reach.

Results of the mass estimate calculations indicate that within the flood plain of the project reach there may be approximately 468 to 870 pounds of PCBs remaining. This residual PCB mass represents about 0.12 to 0.22 percent of the 400,000 pounds estimated to have been discharged to Twelvemile Creek.

The results of the human health risk assessment show that estimated ELCRs were lower than the USEPA's acceptable risk range of 1×10^{-6} to 1×10^{-4} and the HIs were less than USEPA's target HI of 1.

Sediment data collected in accordance with this SRI demonstrate that potential human health risks from residual PCB concentrations are within USEPA acceptable levels within the portion of the project reach of Twevelmile Creek that was investigated. Potential exposures were quantified for current and future kayakers, boaters, waders, and sunbathers. Evaluation of these potential exposures show that both cancer risk and noncancer hazard estimates were at least 25 times lower than the levels considered acceptable by USEPA.

SECTION 8

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Appendix A
Site Photographs

APPENDIX A

Site Photographs

Photograph 1 – View of soil profile sample location SB01.

Photograph 2 – Completed soil trench at SB01.

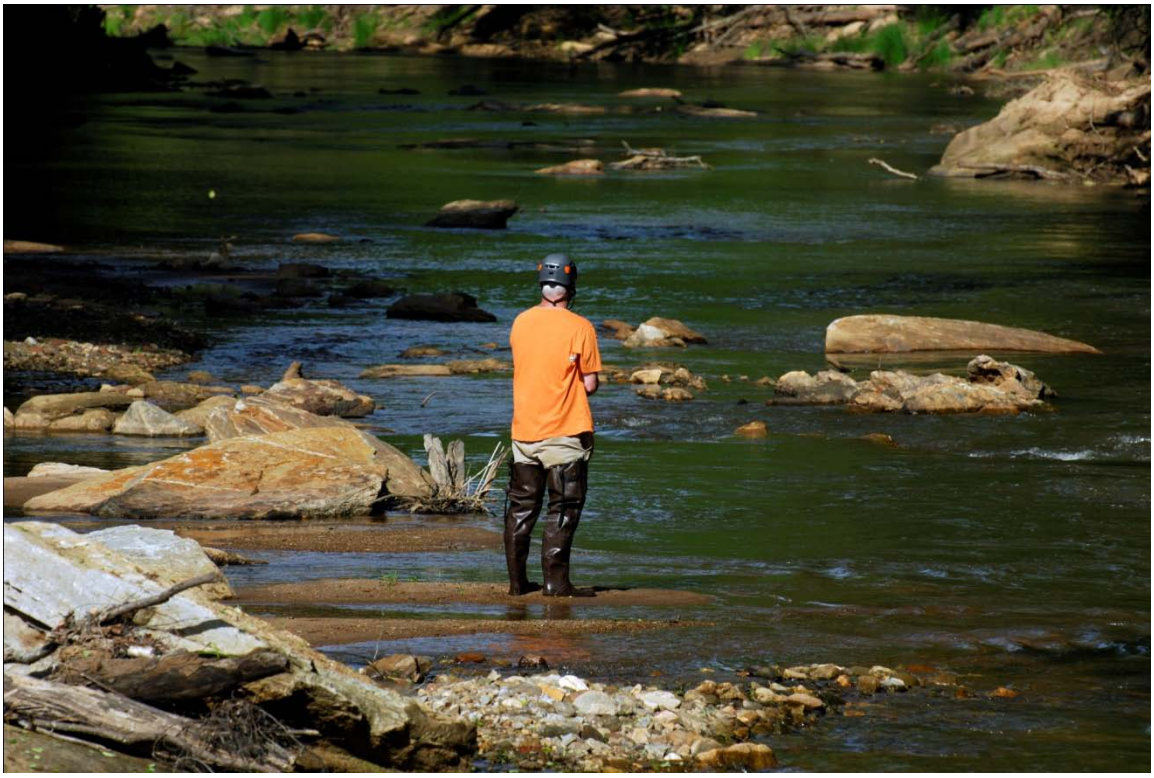
Photograph 3 – Logging soil at SB01.

Photograph 4 – View of soil profile sample location SB02.

Photograph 5 – View of soil profile sample location SB15.

Photograph 6 – Collection of submerged sediment sample at sample location SD03.

Photograph 7 – Collection of submerged sediment sample at sample location SD05.



Photograph 8 – View of submerged sediment sample location SD12.

Photograph 9 – View of incremental sample location DU01 (Balls Beach).

Photograph 10 – View of incremental sampling location DU02 (Cateechee Beach); set up of sampling grid.

Appendix B
Soil Profile Logs

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB01

SIDEWALL TRENCH LOG

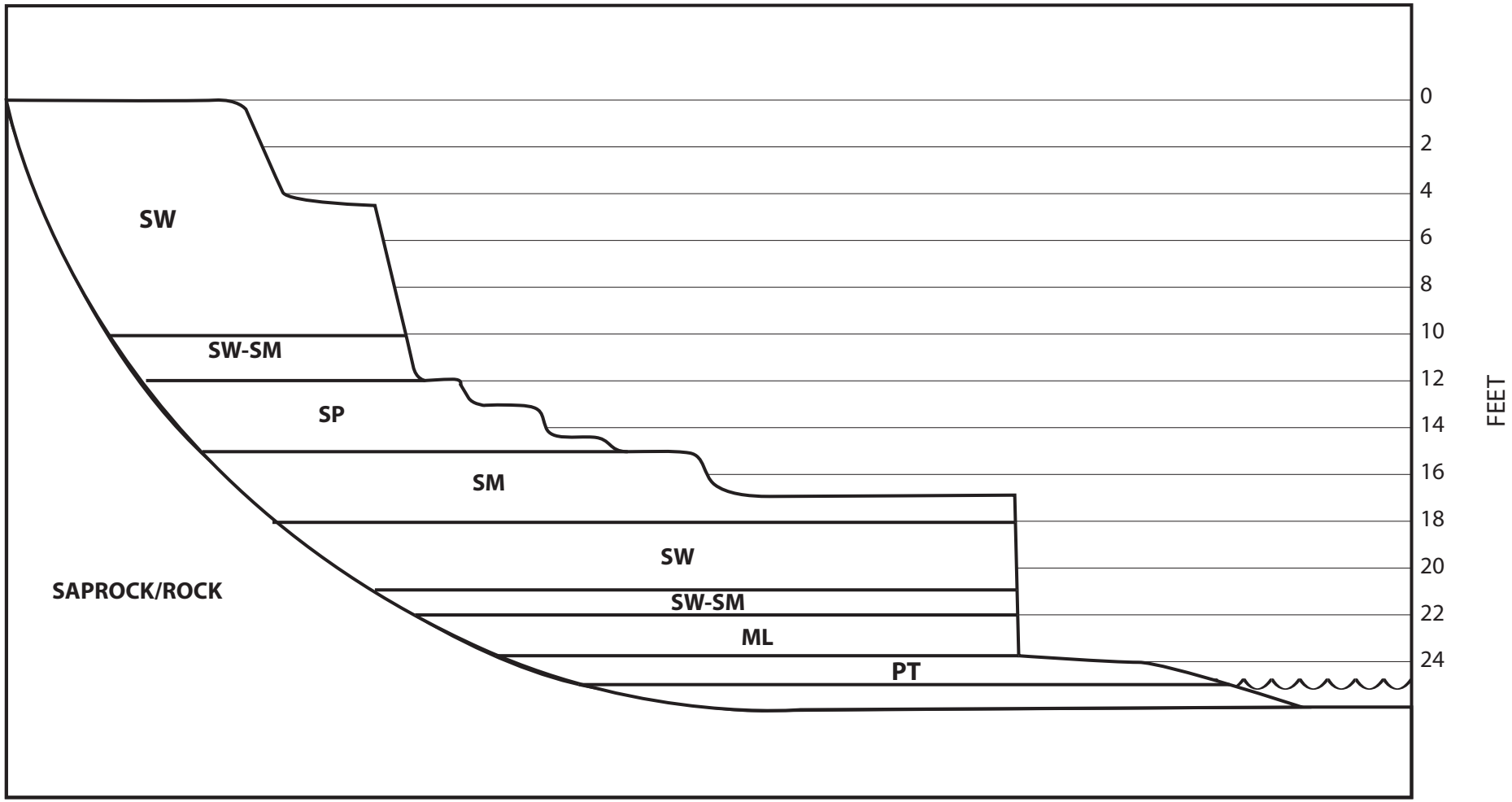
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 53+50 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 17, 2012

APPROX. DIMENS: Length: 38 FT Width: 1-2 FT Max. Height: 25 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	SIDE WALL PROFILE
SOIL DESCRIPTION	
0-2 SAND (SW), yellowish brown, dry, medium to coarse grained sand with fine grained	
sand and minor silt content, high organics (roots)	Side wall profiles presented on the following page.
2-4 SAND (SW), yellowish brown, fine grained sand, with silt, high organics (roots)	
4-6 SAND (SW), brown, damp, fine sand with silt, medium organics (roots)	
6-10 SILTY SAND (SM), brown, damp, fine grained sand with silt, non plastic,	
non cohesive, highly micaceous	
10-12 SAND to SILTY SAND (SW-SM), brown, moist, fine to coarse grained sand with	
lenses of silt and saprolite (from gravel)	
12-15 SAND (SP), mottled red and yellow, dry, coarse grained sand, with layers of red	
alternating with yellow	
15-16 SILTY SAND (SM), brown and black/white mottled, damp, fine grained sand, lower	
0.5' showes layers of black and white	
16-18 SILTY SAND (SM), brown, damp, fine grained sand, slightly plastic, non cohesive,	
bottom 0.15' has red clay, a small lens	
18-21 SAND with SILT (SW), yellowish brown, moist, fine to medium grained sand with	
orbicula shells, siltier lenses	
21-22 SAND and SILTY SAND (SW-SM), yellowish brown, moist, fine to medium grained	
sand with alternating layers of organics sand and silt	
22-24 SILT (ML), dark brown, moist, slightly plastic, non cohesive, with fine grained sand,	
very micaceous, top 0.5' of layer is SILTY SAND (SM), with mottled lenses	
24-25 PEAT (PT), dark brown, moist, heavy leaf litter	
25 + Open water of the river	

SIDE WALL PROFILE - SB01



PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB02

SIDEWALL TRENCH LOG

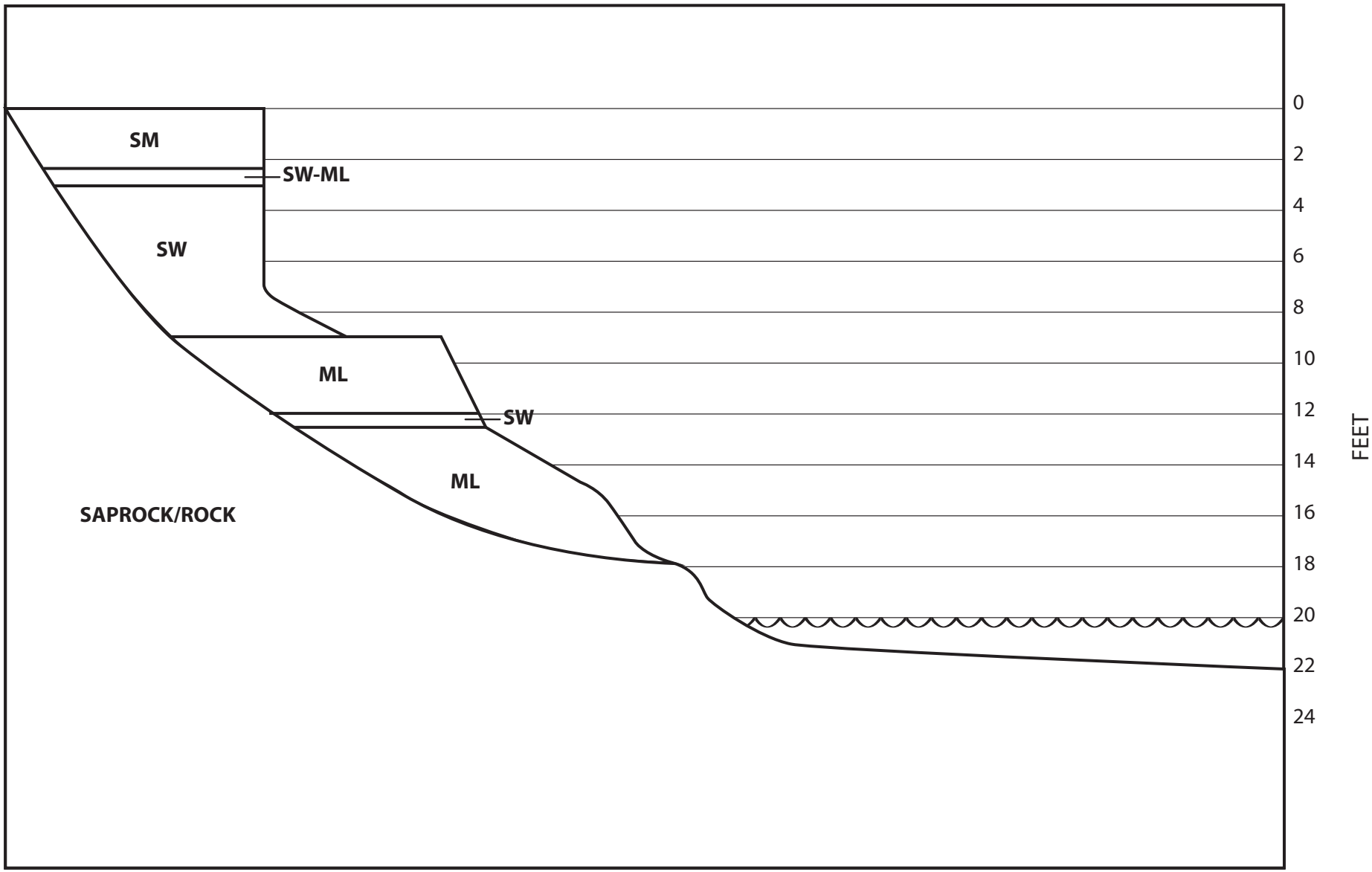
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 53+50 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 17, 2012

APPROX. DIMENS: Length: 21 FT Width: 1-2 FT Max. Height: 20 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-2.4	SILTY SAND (SM), yellowish brown, dry, non plastic, non cohesive, fine to medium	
	grained sand, some orange mottling	Side wall profiles presented on the following page.
2.4-2.9	SAND (SW) and SILT (ML) interbedded (2" SAND by 2" SILT) (x4)	
	SAND (SW), light gray, dry, fine to medium grained sand, few silt, cross bedded	
	SILT (ML), gray, non plastic, non cohesive, some bedding with organics	
2.9-9	SAND (SW), yellowish brown, dry, fine to coarse grained sand, interbedded with	
	fine lenses of silt up to 2" thick.	
9-12	SILT (ML), brown, damp, stiff, non plastic, non cohesive, with organics (roots)	
12-12.5	SAND (SW), tan, dry, medium to coarse grained sand, with organics (roots)	
12.5-18	SILT (ML), dark brown, moist, slightly plastic, non cohesive, micaceous silt, trace fine	
	grained sand	
18+	SAPROLITE, saprolite rock of micaceous gneiss	

SIDE WALL PROFILE - SB02



PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB03

SIDEWALL TRENCH LOG

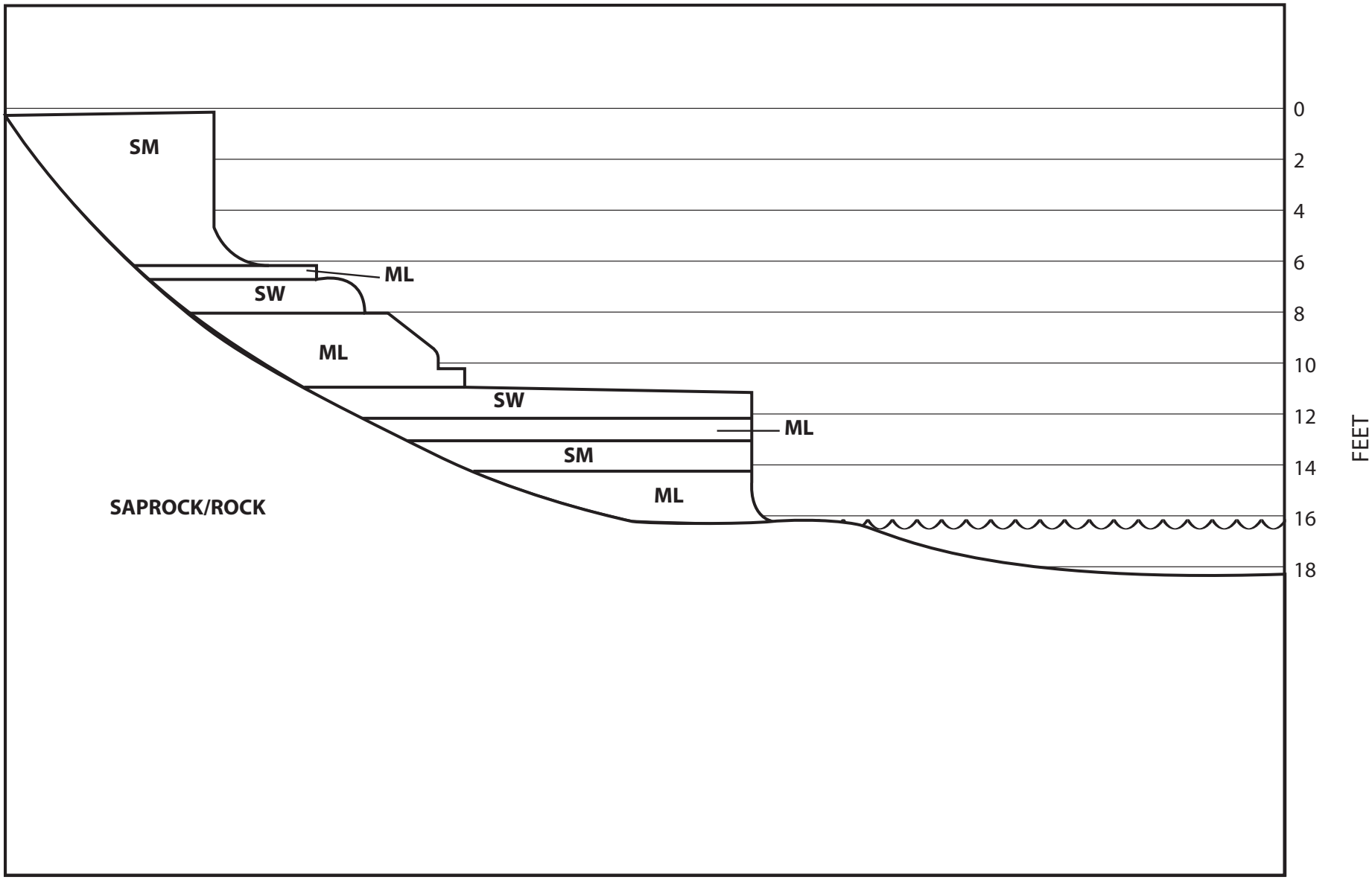
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 45+50 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 17, 2012

APPROX. DIMENS: Length: 22 FT Width: 1-2 FT Max. Height: 16 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-6	SILTY SAND (SM), light brown, dry, fine to medium graine sand, non plastic,	
	non cohesive, high organics (roots)	Side wall profiles presented on the following page.
6-6.5	SANDY SILT (ML), brown, dry, non plastic, non cohesive, fine to medium grained	
	sand, high organics (roots)	
6.5-8	SAND (SW), yellowish tan, dry, fine to coarse grained sand, cross bedding	
8-11	SILT (ML), brown, moist/damp, non plastic, non cohesive, few fine grined sand,	
	few fine lenses of fine grained sand	
11-12	SAND (SW), yellowish tan, dry, fine to coarse grained sand, shell fragments, wood	
	at the bottom of the layer	
12-13.2	SANDY SILT (ML), brown, moist, non plastic, non cohesive, fine to coarse grained	
	sand, high organics with wood and leaves interbedded with sand layers	
13.2-14.2	SILTY SAND (SM), gray to brown mottled, trending down, dry, fine to medium	
	grained sand	
14.2-16	SILT (ML), dark brown, moist to wet, low plasticity, non cohesive	
16'+	SAPROLITE, saprolite rock of micaceous gneiss	

SIDE WALL PROFILE - SB03



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB04

SIDEWALL TRENCH LOG

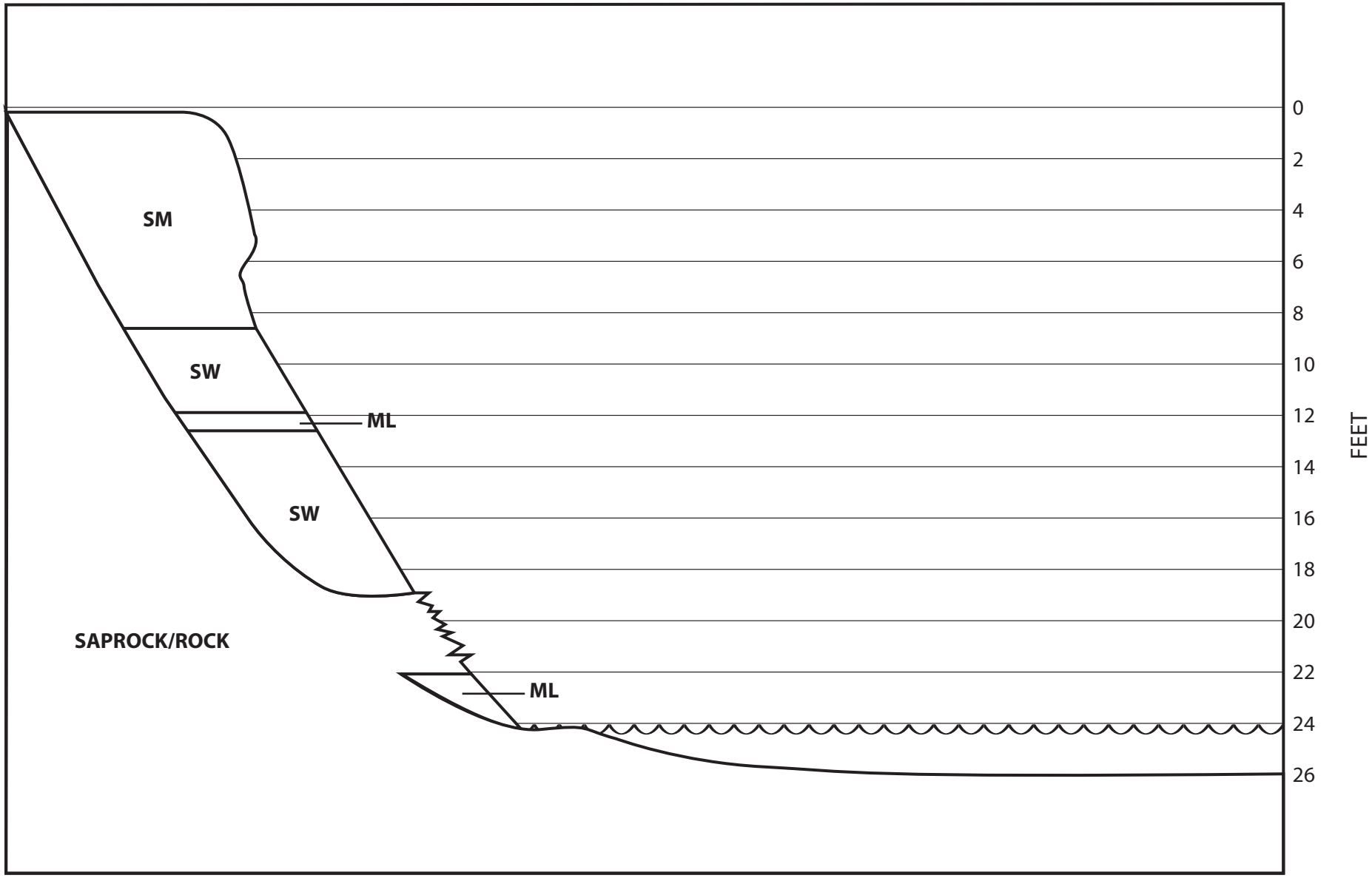
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 45+50 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 24, 2012

APPROX. DIMENS: Length: 13 FT Width: 1-2 FT Max. Height: 24 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	SIDE WALL PROFILE
SOIL DESCRIPTION	
0-6 SILTY SAND (SM), reddish brown, dry, fine to medium grained sand, very heavy	
organics (roots)	Side wall profiles presented on the following page.
6-8.5 SILTY SAND (SM), brownish red, dry, fine to medium grained sand, some organics	
8.5-12 SAND (SW), tannish yellow, dry, fine to coarse grained sand, few layers of silt,	
non plastic, non cohesive	
12-12.4 SILT (ML), brown, moist, non plastic, non cohesive, with few leaves	
12.4-19 SAND (SW), tan, damp/dry, fine to coarse grained sand	
19-22 BIOTITE GNEISS, SAPROCK, golden yellow to bright silver, with pegmatite and	
and quartzite	
22-24 SILT (ML), brown to dark brown, moist, medium plastic, non cohesive	

SIDE WALL PROFILE - SB04



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB05

SIDEWALL TRENCH LOG

PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 40+00 | LOGGER : Antonio Luna

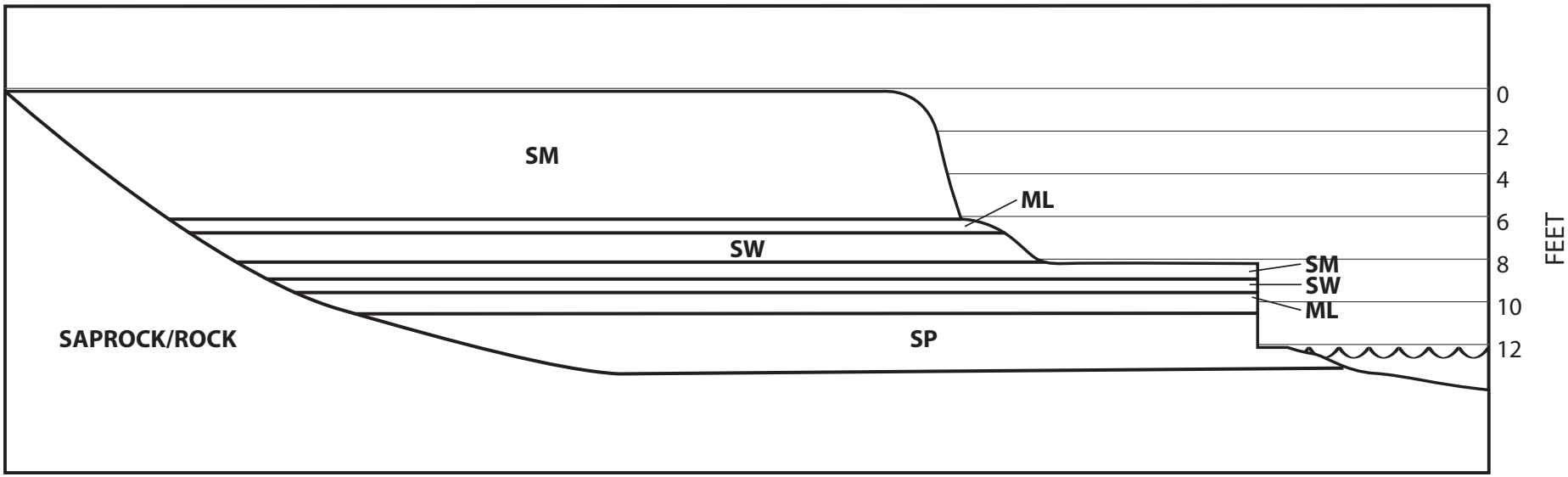
CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 19, 2012

APPROX. DIMENS: Length: 26 FT Width: 1-2 FT Max. Height: 12 FT

SIDEWALL TRENCH DIMENSIONS (FT)

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-6	SILTY SAND (SM), brownish red, damp, fine to medium grained sand, non plastic	
	non cohesive, with oganics (roots)	Side wall profiles presented on the following page.
6-6.5	SILT with SAND (ML), brown, moist, non plastic, non cohesive, with organics	
6.5-8	SAND (SW), gray, damp, fine to coarse grained sand, with layers of silt	
8-8.7	SILTY SAND (SM), brown, moist, fine to medium grained sand, non plastic,	
	non cohesive	
8.7-9.2	SAND (SW), reddish brown, moist, fine to coarse grained sand	
9.2-10.2	SILT (ML), brown, wet, non plastic, non cohesive, high organic peat	
10.2-12	SAND (SP), yellow, dry to wet (downward), coarse grained sand, cross bedding	
	very pronounced	
12 +	Open water of the river	

SIDE WALL PROFILE - SB05



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB06

SIDEWALL TRENCH LOG

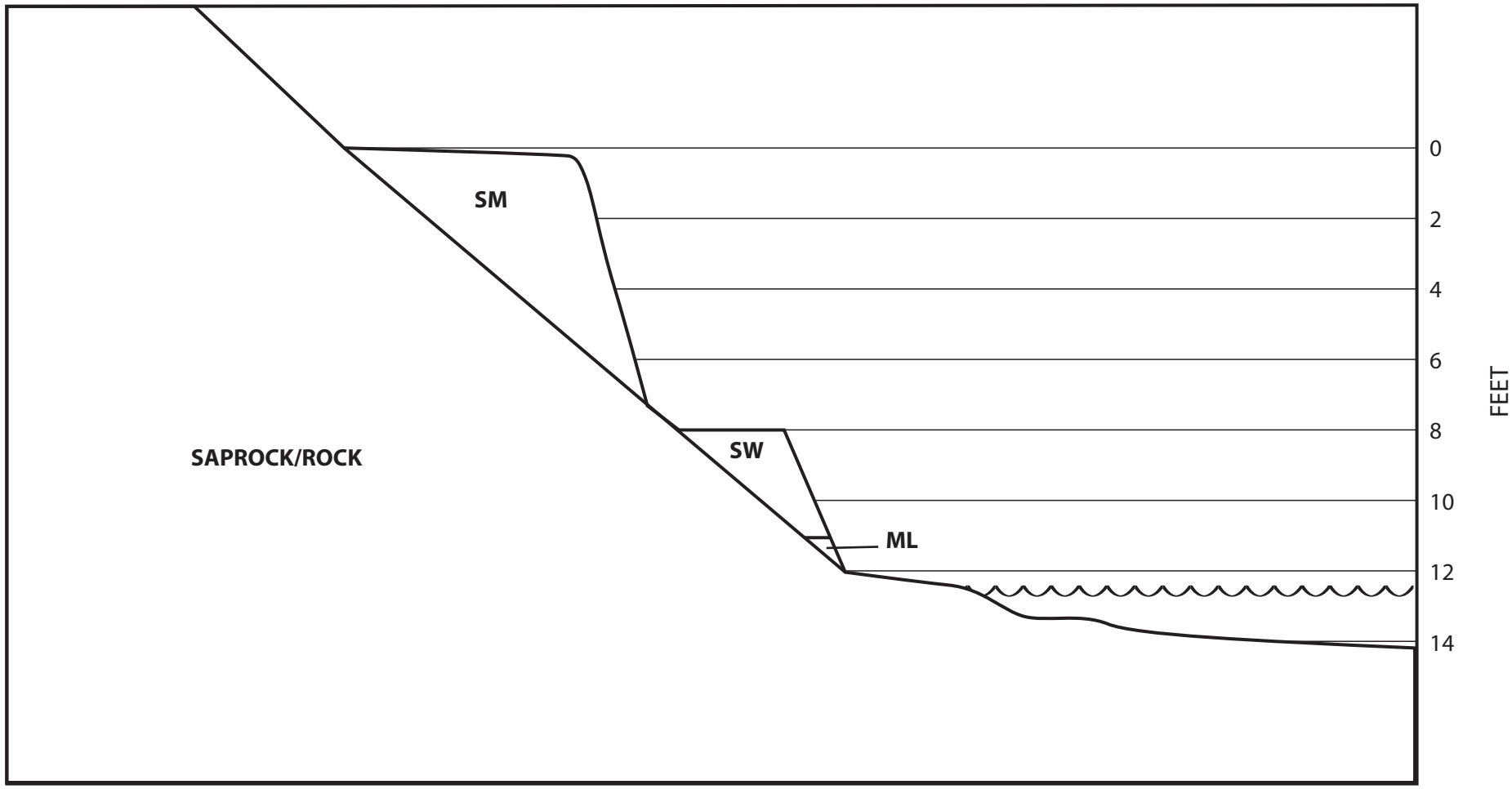
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 40+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 24, 2012

APPROX. DIMENS: Length: 16 FT Width: 1-2 FT Max. Height: 12 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-7	SILTY SAND (SM), reddish brown, damp, fine to medium grained sand with high organics (roots)	Side wall profiles presented on the following page.
7-8	BIOTITE GNEISS, SAPROCK, golden yellow, brittle, non friable	
8-11	SAND (SW), tannish yellow, damp, fine to coarse grained sand, fining downward, cross bedded	
11-12	SILT (ML), dark brown, moist to wet, moderately plastic, non cohesive	

SIDE WALL PROFILE - SB06



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB07

SIDEWALL TRENCH LOG

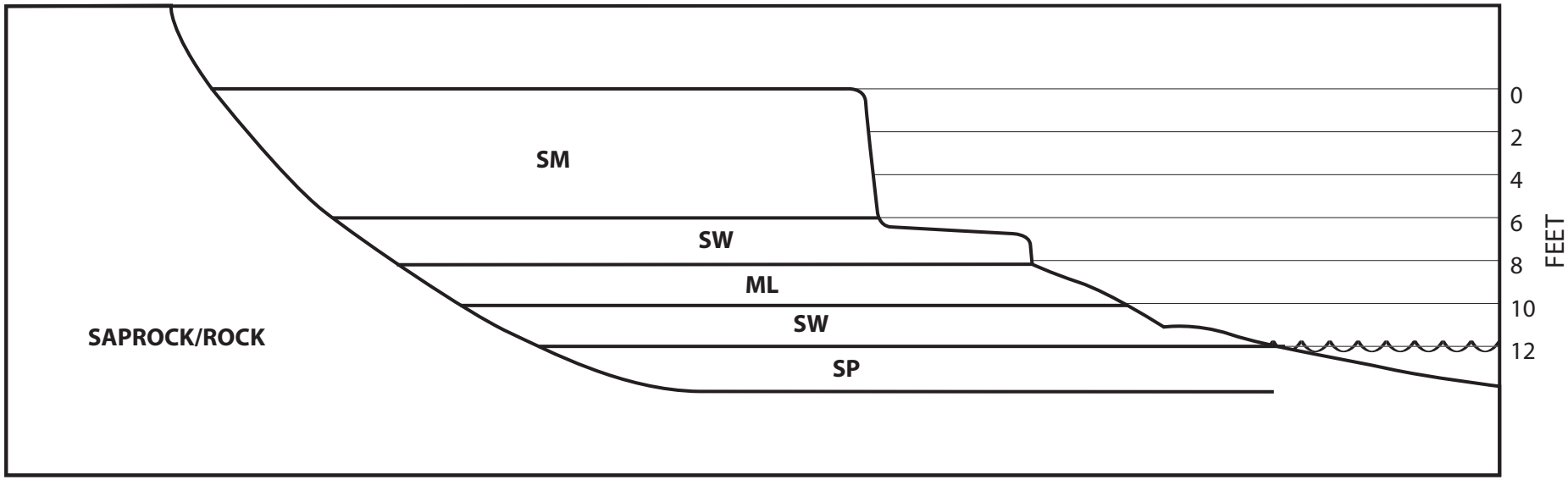
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 37+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 19, 2012

APPROX. DIMENS: Length: 20 FT Width: 1-2 FT Max. Height: 12 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	SIDE WALL PROFILE
SOIL DESCRIPTION	
0-6 SILTY SAND (SM), brownish red, damp, fine to medium graine sand, non plastic	
non cohesive, with organics (roots)	it fe
6-8 SAND (SW), tan, damp, fine to coarse grained sand, interbedded with silt layers	
8-10 SILT with SAND (ML), brown, moist, non plastic, non cohesive, with organics	
10-11 SAND (SW), reddish yellow, moist to wet, fine to coarse grained sand, interbedded	
with gray silt	
11-12 SAND (SW), gray, wet, medium to coarse grained sand	

SIDE WALL PROFILE - SB07



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB08

SIDEWALL TRENCH LOG

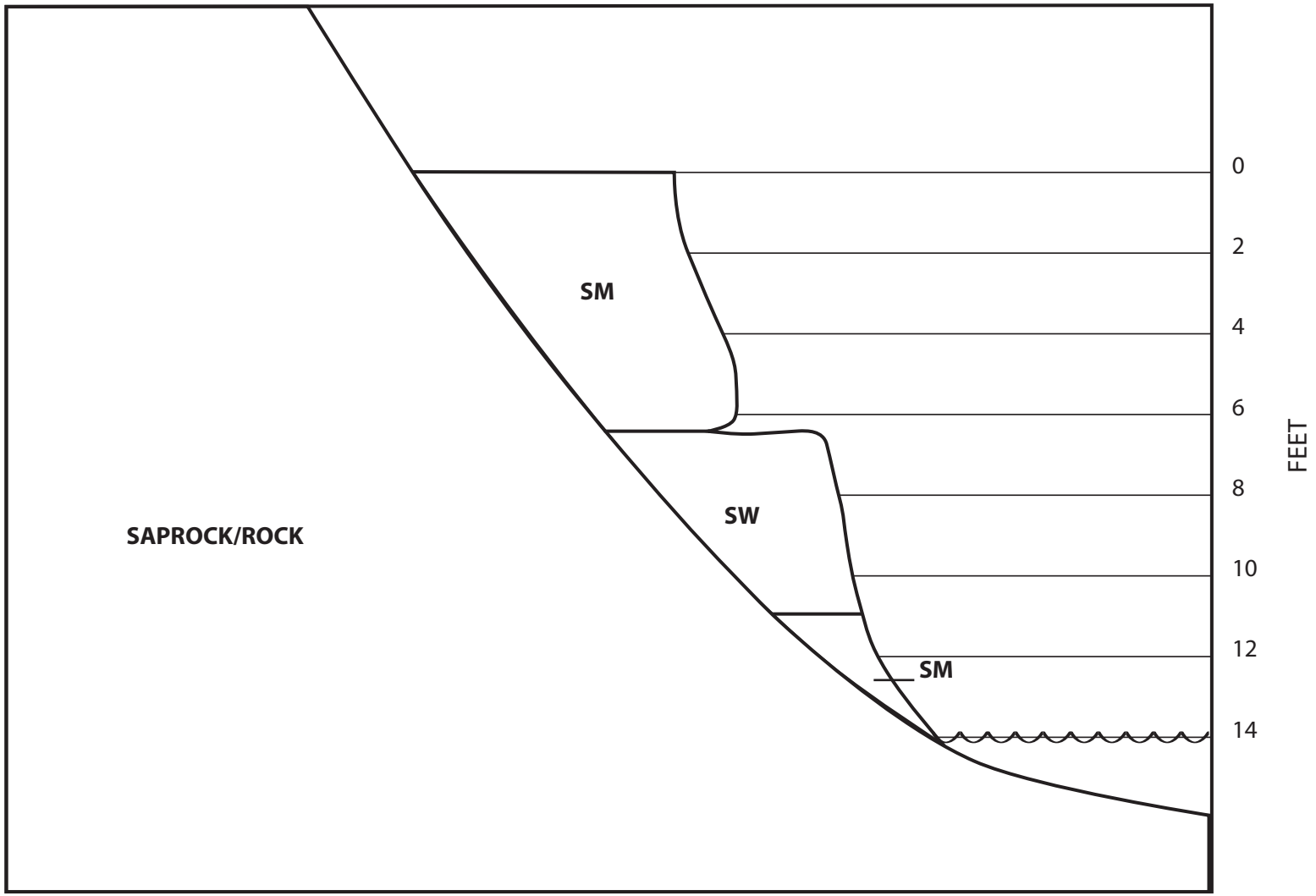
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 37+50 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 20, 2012

APPROX. DIMENS: Length: 10 FT Width: 1-2 FT Max. Height: 14 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-6.5	SAND with SILT(SM), brownish red, damp, fine to medium grained sand, with	
	organics (roots)	Side wall profiles presented on the following page.
6.5-7	SAND (SW), tan, damp, medium to coarse graned sand, with layers of silt	
7-10	SAND (SW), reddish brown, damp, fine to medium grained sand, trace layers of silt,	
	2" Layer of silty sand at 7.5'	
10-11	SAND (SW), tan, damp, fine to medium grained sand	
11-14	SILTY SAND (SM), reddish brown, damp to wet, fine to medium grained sand,	
	fine layers of silt, fining downward	

SIDE WALL PROFILE - SB08



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB09

SIDEWALL TRENCH LOG

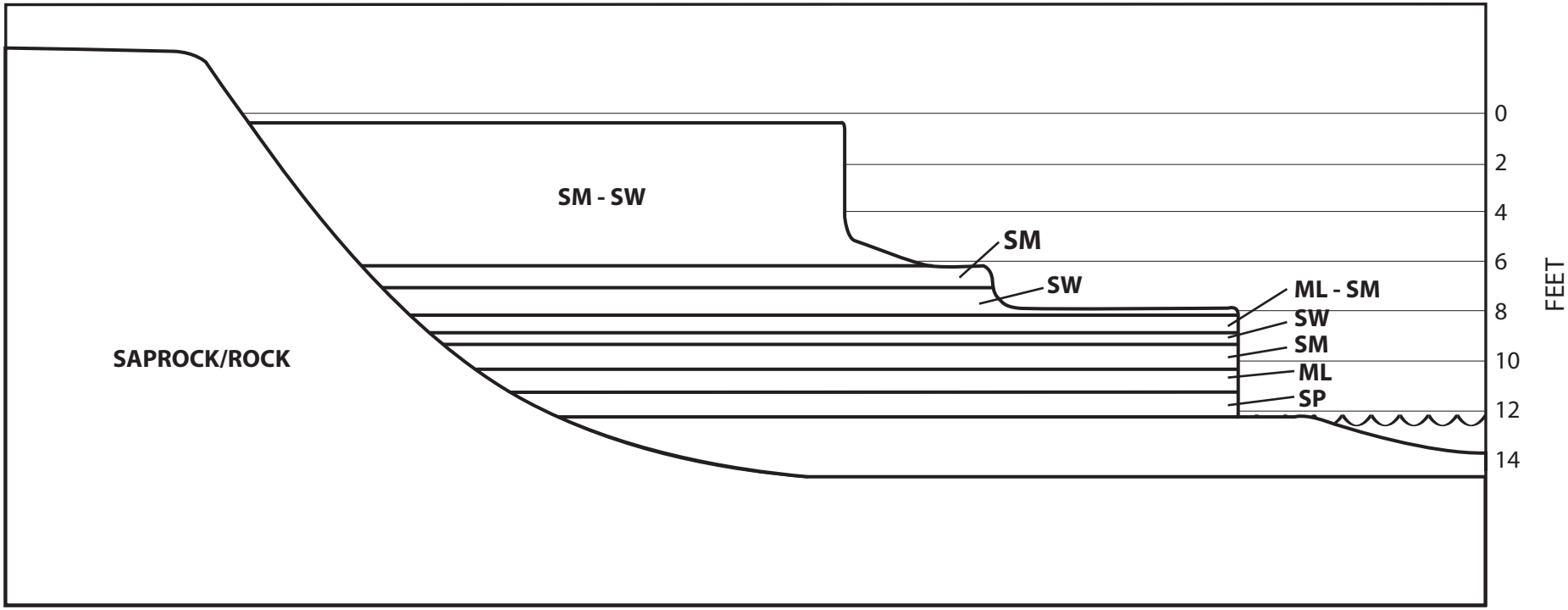
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 31+50 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 19, 2012

APPROX. DIMENS: Length: 18 FT Width: 1-2 FT Max. Height: 12 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-6	SILTY SAND - SAND (SM-SW), brownish red, damp, loose to medium dense, fine to	
	medium grained sand, with organics (roots)	Side wall profiles presented on the following page.
6-7	SAND with SILT (SM), mottled brown/brownish red/tan, damp, fine to coarse grained	
	sand, with lenses of silt and micaceous material	
7-8	SAND (SW), tan with black mica layers, fine to medium grained sand	
8-8.5	SILT to SILTY SAND (ML-SM), tan to brown, damp, non plastic, non cohesive, fine to	
	medium grained sand, fining downward	
8.5-9	SAND (SW), tan, damp, fine to medium grained sand	
9-10	SILTY SAND (SM), reddish brown to brown, damp to moist, fine to coarse grained	
	sand with silt, non plastic, non cohesive, few subrounded medium grained gravel	
10-11	SILT with SAND (ML), brown, moist, non plastic, non cohesive, fine to medium	
	grained sand, non plastic, non cohesive, high organic layer	
11-12	SAND (SP), yellowish red, moist to wet, coarse grained sand	

SIDE WALL PROFILE - SB09



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB10

SIDEWALL TRENCH LOG

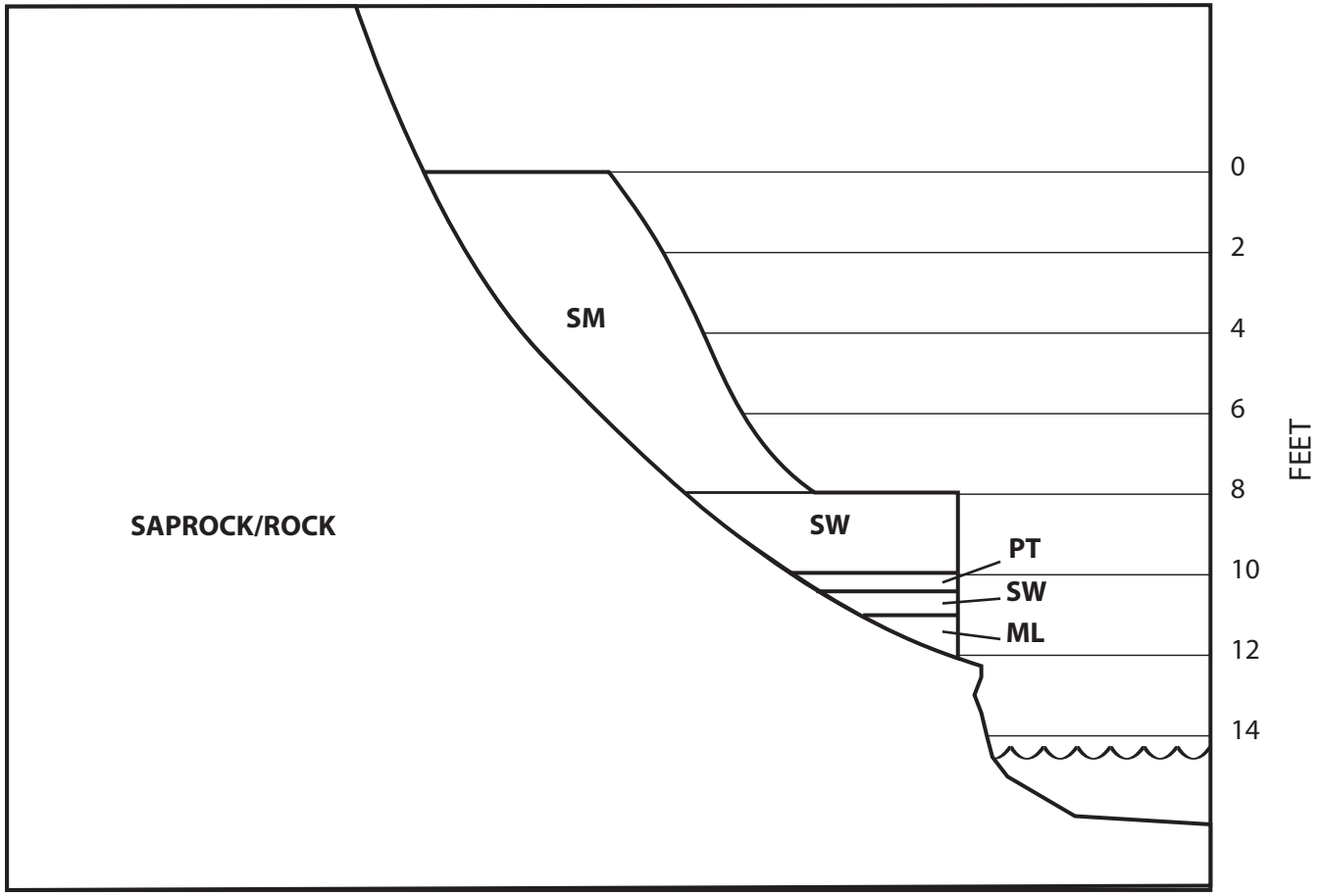
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 32+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 20, 2012

APPROX. DIMENS: Length: 16 FT Width: 1-2 FT Max. Height: 14 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	SIDE WALL PROFILE
SOIL DESCRIPTION	
0-8 SAND with SILT (SM), brownish red, damp, fine to medium grained sand	
with organics (roots)	Side wall profiles presented on the following page.
8-10 SAND (SW), light brown/tan, damp, fine to coarse grained sand, fine layers	
of organic material (leaves)	
10-10.5 PEAT (PT), dark brown, moist, leaf litter, some fine to medium grained sand	
10.5-11 SAND (SW), light brown to dark brown, moist to damp, fine to medium grained sand,	
fine to 2" layers of silt	
11-12 SILT (ML), dark grayish green, moist to wet, moderately plastic, non cohesive,	
micaceous	
12-14 SAPROCK of micaceous Gneiss	

SIDE WALL PROFILE - SB10



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB13

SIDEWALL TRENCH LOG

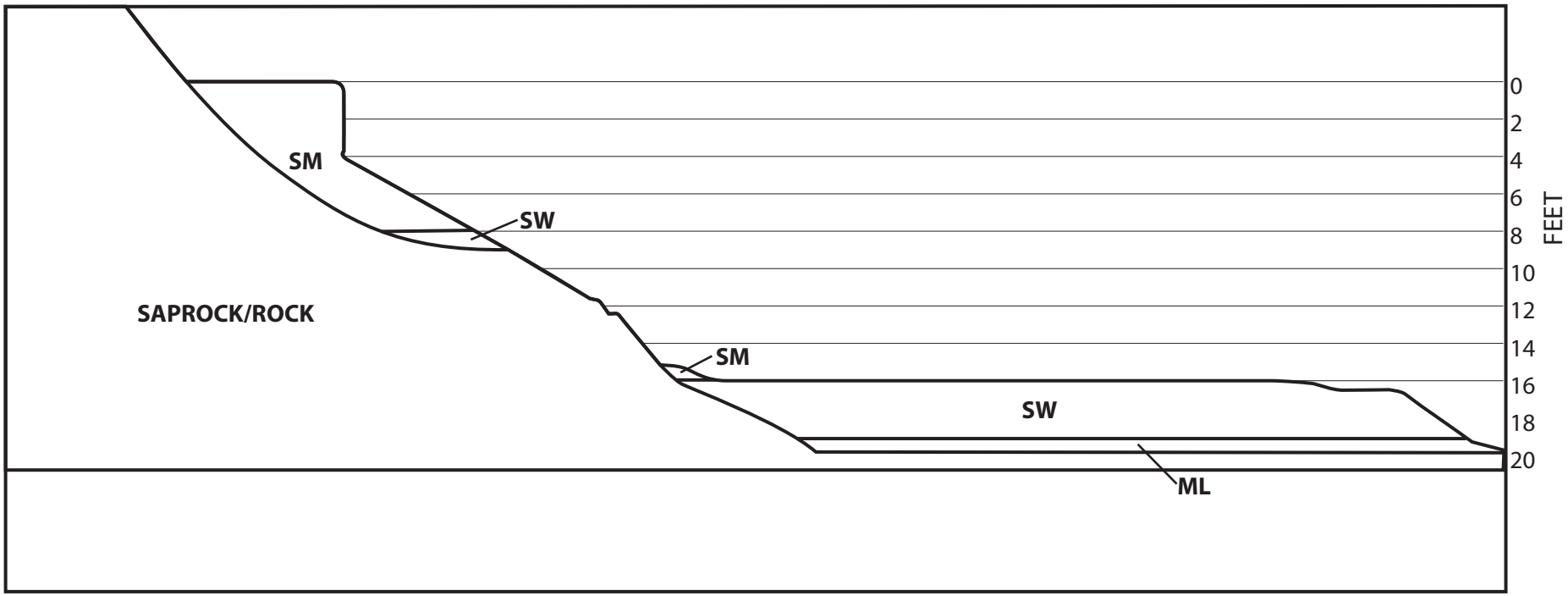
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 11+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 19, 2012

APPROX. DIMENS: Length: 60 FT Width: 1-2 FT Max. Height: 20 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-8	SILTY SAND (SM), reddish brown, damp, fine to coarse grained sand, non plastic,	
	non cohesive, with high organics (peat/root mass)	Side wall profiles presented on the following page.
8-9	SAND (SW), tan, damp, medium grained sand, with layers of silt	
9-12.5	SAPROLITE, red, friable, mica rich very soft, parent rock was biotite gneiss	
12.5-15.5	BIOTITE GNEISS, soft saprock, unable to sample	
15.5-16	SILTY SAND (SM), dark brown, non plastic, non cohesive, fine to medium grained	
	sand	
16-19.5	SAND (SW), yellowish tan, dry, fine to coarse grained sand	
19.5-20	SILT (ML), dark brown, wet, slightly plastic, non cohesive	

SIDE WALL PROFILE - SB13



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB14

SIDEWALL TRENCH LOG

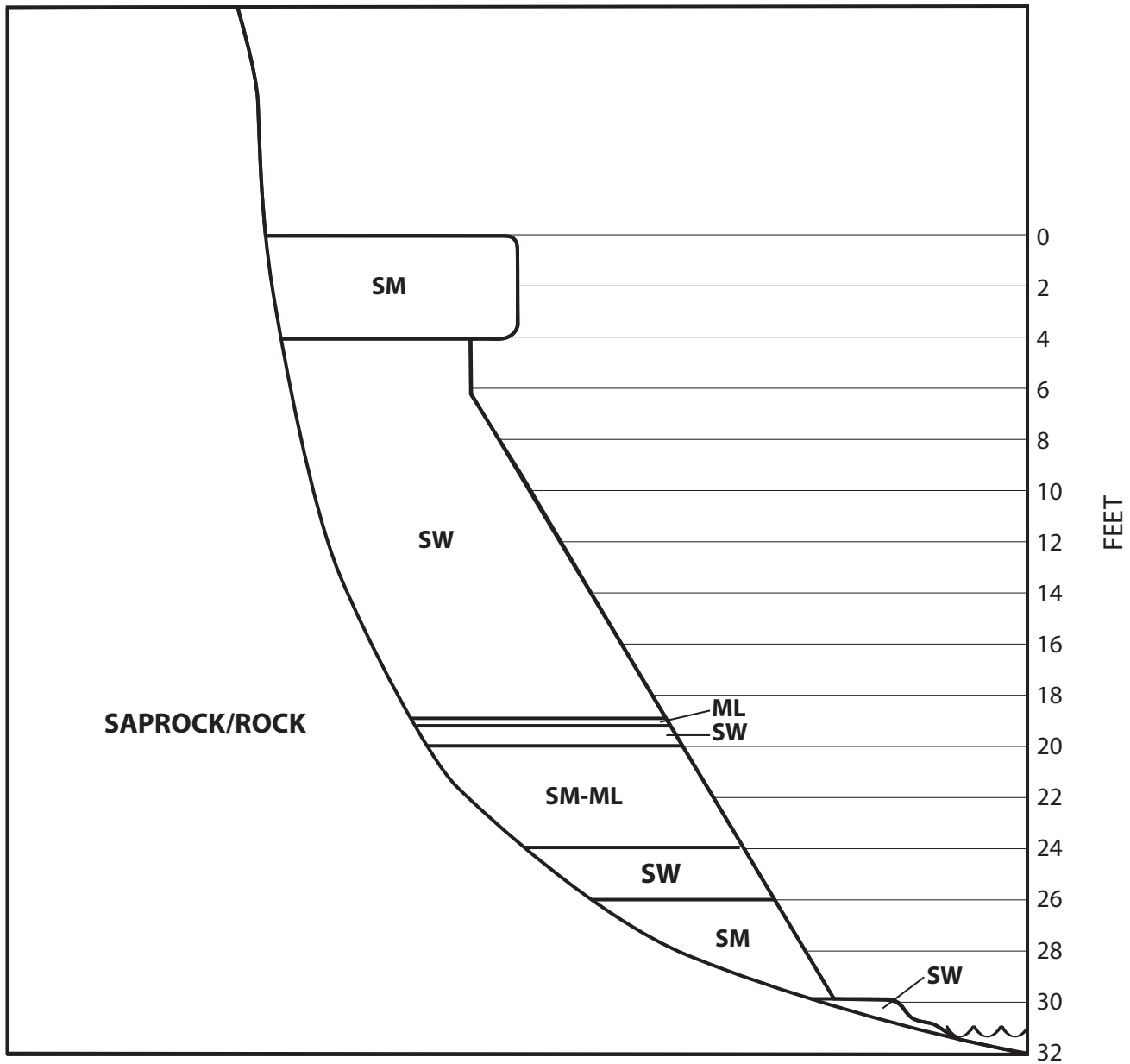
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 10+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 25, 2012

APPROX. DIMENS: Length: 30 FT Width: 1-2 FT Max. Height: 31 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	SIDE WALL PROFILE
SOIL DESCRIPTION	
0-4 SILTY SAND (SM), brownish red, damp, fine to medium grained sand, non plastic,	
non cohesive, highly organic (roots)	Side wall profiles presented on the following page.
4-19 SAND (SW), tan, dry, cross bedded, fine to coarse grained sand, few lenses of silt	
19-19.2 SILT (ML), brown, moist, non plastic, non cohesive	
19.2-20 SAND (SW), tan, damp, cross bedded, fine to medium grained sand	
20-24 SILTY SAND - SANDY SILT (SM - ML), brown, moist, fine to coarse grained sand'	
non plastic, non cohesive	
24-26 SAND (SW), reddish yellow, moist, fine to coarse grained sand	
26-30 SILT (SM), reddish brown, moist, non plastic, non cohesive	
30-31 SAND (SW), grayish blue, wet, high dilatency, fine to medium grained sand, organics	
(roots), strong organic odor	

SIDE WALL PROFILE - SB14



CH2MHILL

CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB15

SIDEWALL TRENCH LOG

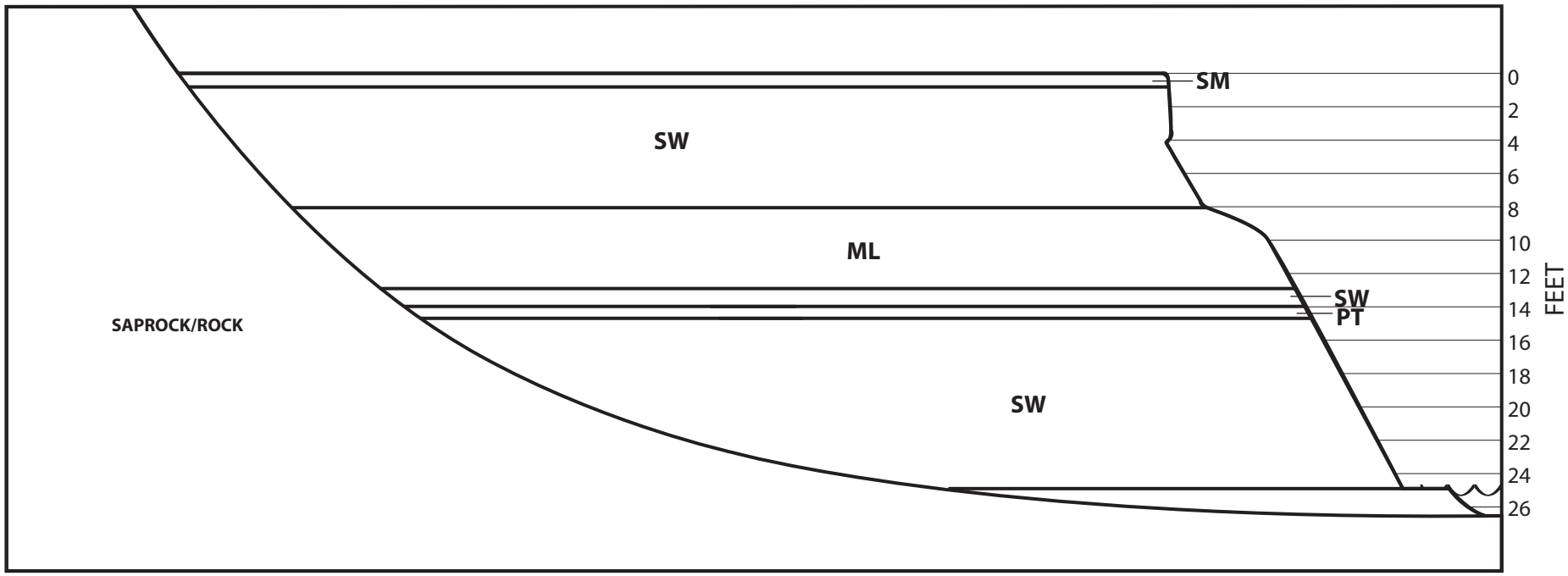
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 8+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 19, 2012

APPROX. DIMENS: Length: 60 FT Width: 1-2 FT Max. Height: 25 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-0.8	SILTY SAND (SM), dark brown, moist, micaceous sand, non plastic, non cohesive	
0.8-2	SAND (SW), brown, damp, with silt layers, fine to coarse grained sand	Side wall profiles presented on the following page.
2-8	SAND (SW), yellowish brown/tan, dry to damp, fine to coarse grained sand	
8-13	SILT with SAND (ML), dark brown, moist, non plastic, non cohesive, few fine to	
	medium grained sand	
13-14	SAND (SW), damp to dry, fine to coarse grained sand	
14-14.5	PEAT (PT), organic peat layer	
14.5-25	SAND (SW), dry to damp, fine to coarse grained sand	

SIDE WALL PROFILE - SB15



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB16

SIDEWALL TRENCH LOG

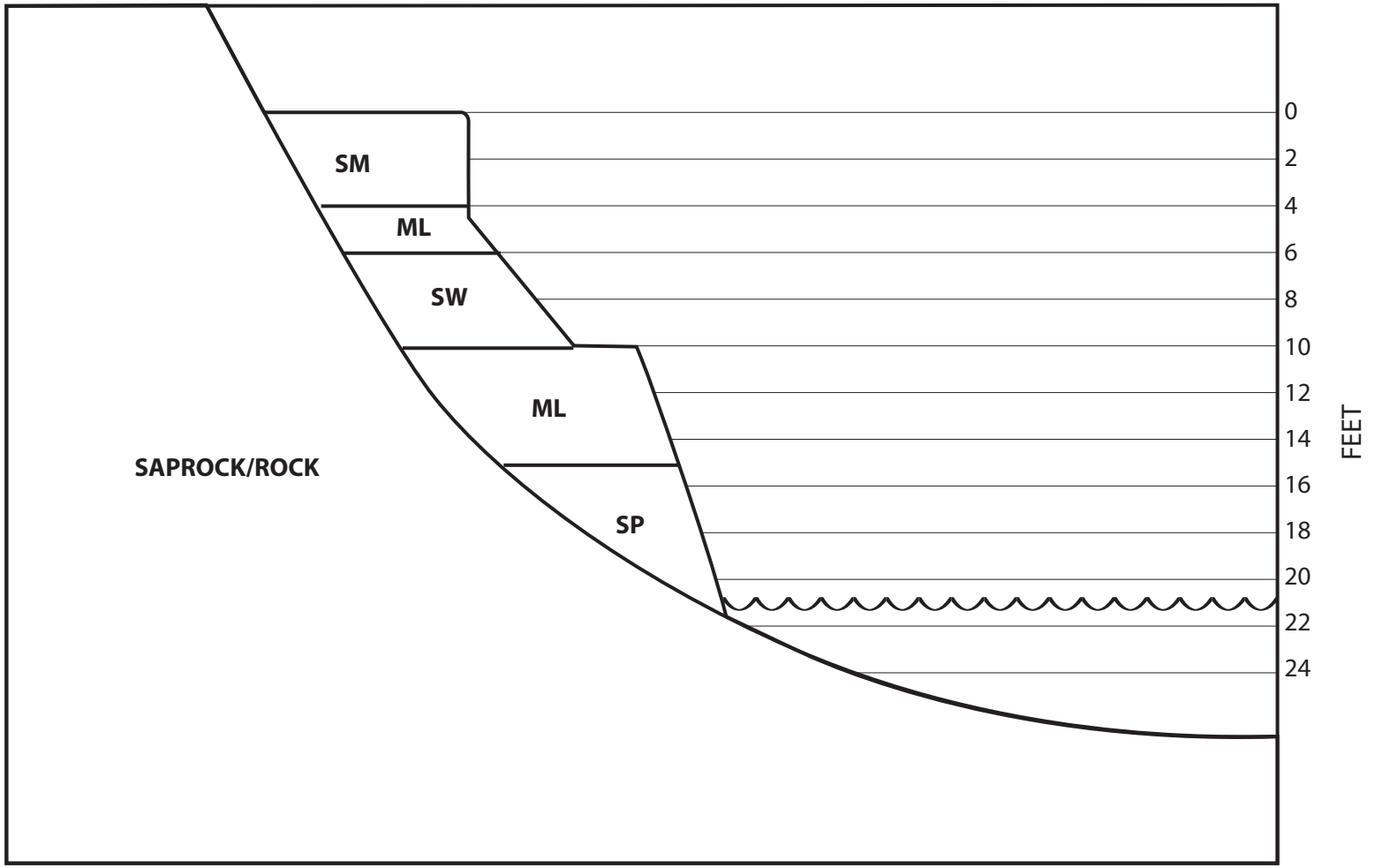
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 8+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 24, 2012

APPROX. DIMENS: Length: 12 FT Width: 1-2 FT Max. Height: 21 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	SIDE WALL PROFILE
SOIL DESCRIPTION	
0-4 SILTY SAND (SM), reddish brown, dry, fine to medium grained sand, non plastic,	
non cohesive, with organics (roots)	Side wall profiles presented on the following page.
4-6 SILT (ML), brown, damp, non plastic, non cohesive, few fine sand	
6-10 SAND (SW), tan, dry, fine to coarse grained sand, laminae of black silt, cross	
bedding features	
10-15 SILT with SAND (ML), brown, damp, non plastic, non cohesive, laminated,	
micaceous, some leaves	
15-21 SAND (SP), orangeish brown, damp, coarse grained, cross bedded	

SIDE WALL PROFILE - SB16



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB17

SIDEWALL TRENCH LOG

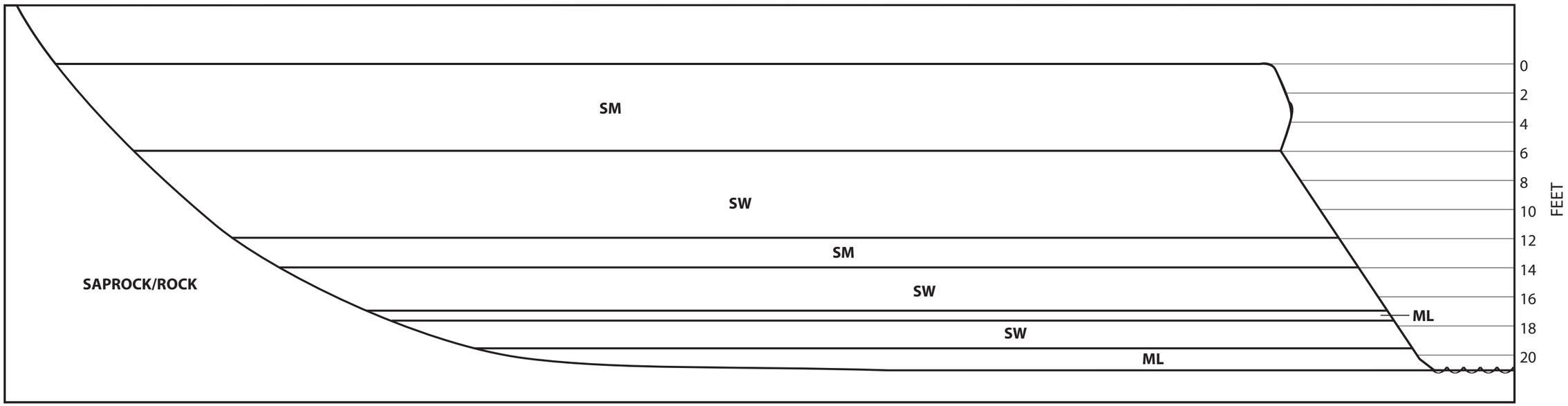
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 6+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 25, 2012

APPROX. DIMENS: Length: 10 FT Width: 1-2 FT Max. Height: 20 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-6	SILTY SAND (SM), reddish brown, damp, fine to medium grained sand, non plastic,	
	non cohesive	Side wall profiles presented on the following page.
6-12	SAND (SW), reddish yellow, dry, fine to coarse grained sand, few silt layers	
12-14	SILT (SM), reddish brown, moist, non plastic, non cohesive	
14-17	SAND (SW), reddish yellow, dry, fine to coarse graind sand, few silt layers	
17-17.5	SILT (ML), brown, moist, non plastic, non cohesive	
17.5-19.8	SAND (SW), yellowish red, damp, fine to coarse grained sand	
19.8-21	SILT (ML), brown/grayish brown mottled, wet, non plastic, non cohesive	
21+	SAPROCK, BIOTITE GNEISS, yellow	

SIDE WALL PROFILE - SB17



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB18

SIDEWALL TRENCH LOG

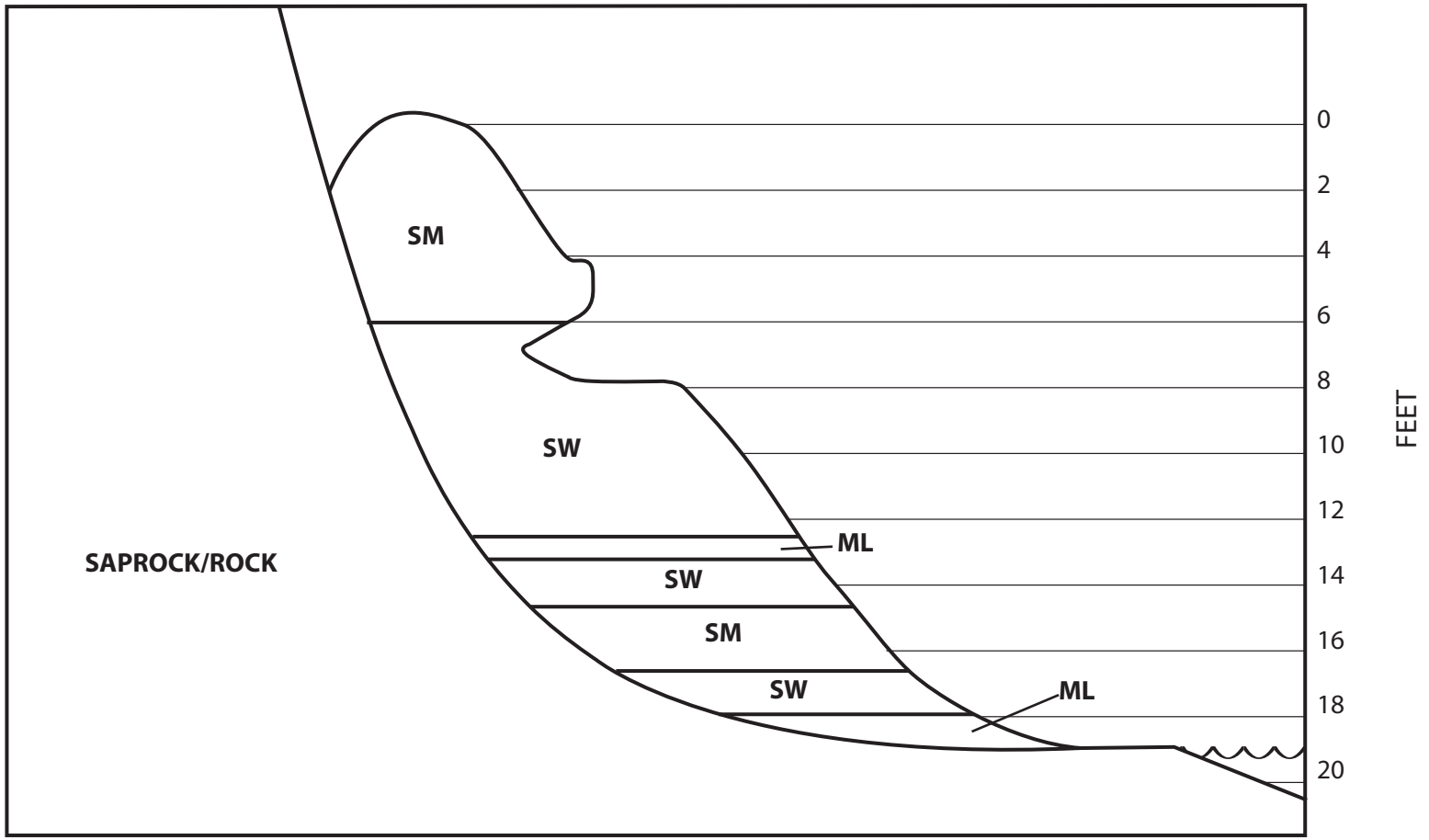
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 6+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 25, 2012

APPROX. DIMENS: Length: 16 FT Width: 1-2 FT Max. Height: 19 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.		SIDE WALL PROFILE
SOIL DESCRIPTION		
0-6	SILTY SAND (SM), reddish brown, dry, fine to medium grained sand, high organics	
	(roots)	Side wall profiles presented on the following page.
6-13	SAND (SW), reddish yellow, dry, fine to coarse grained sand, fine laminae of silt,	
	cross bedding	
13-13.5	SILT (ML), brown, moist, non plastic, non cohesive, few fine grained sand	
13.5-15	SAND (SW), reddish yellow, damp, fine to coarse grained sand	
15-17	SILT (SM), brown, moist, non plastic, non cohesive, few fine grained sand	
17-18	SAND (SW), reddish tan, moist, fine to coarse grained sand	
18-19	SILT (ML), dark brown, moist to wet, non plastic, non cohesive	

SIDE WALL PROFILE - SB18



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB19

SIDEWALL TRENCH LOG

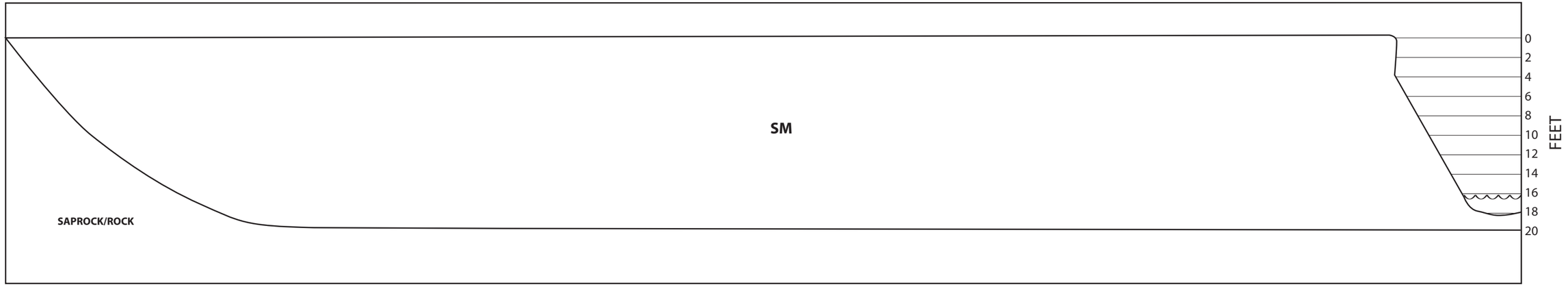
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 1+00 | LOGGER : ANTONIO LUNA

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 25, 2012

APPROX. DIMENS: Length: 8 FT Width: 1-2 FT Max. Height: 17 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	SIDE WALL PROFILE
SOIL DESCRIPTION	
0-17 SILTY SAND (SM), yellowish red, dry, loose, fine to coarse grained sand, non plastic	
non cohesive, high organic (roots)	Side wall profiles presented on the following page.
ye	

SIDE WALL PROFILE - SB19



CH2MHILL

PROJECT NUMBER	SAMPLE LOCATION NUMBER
428280.01.SP	SB20

SIDEWALL TRENCH LOG

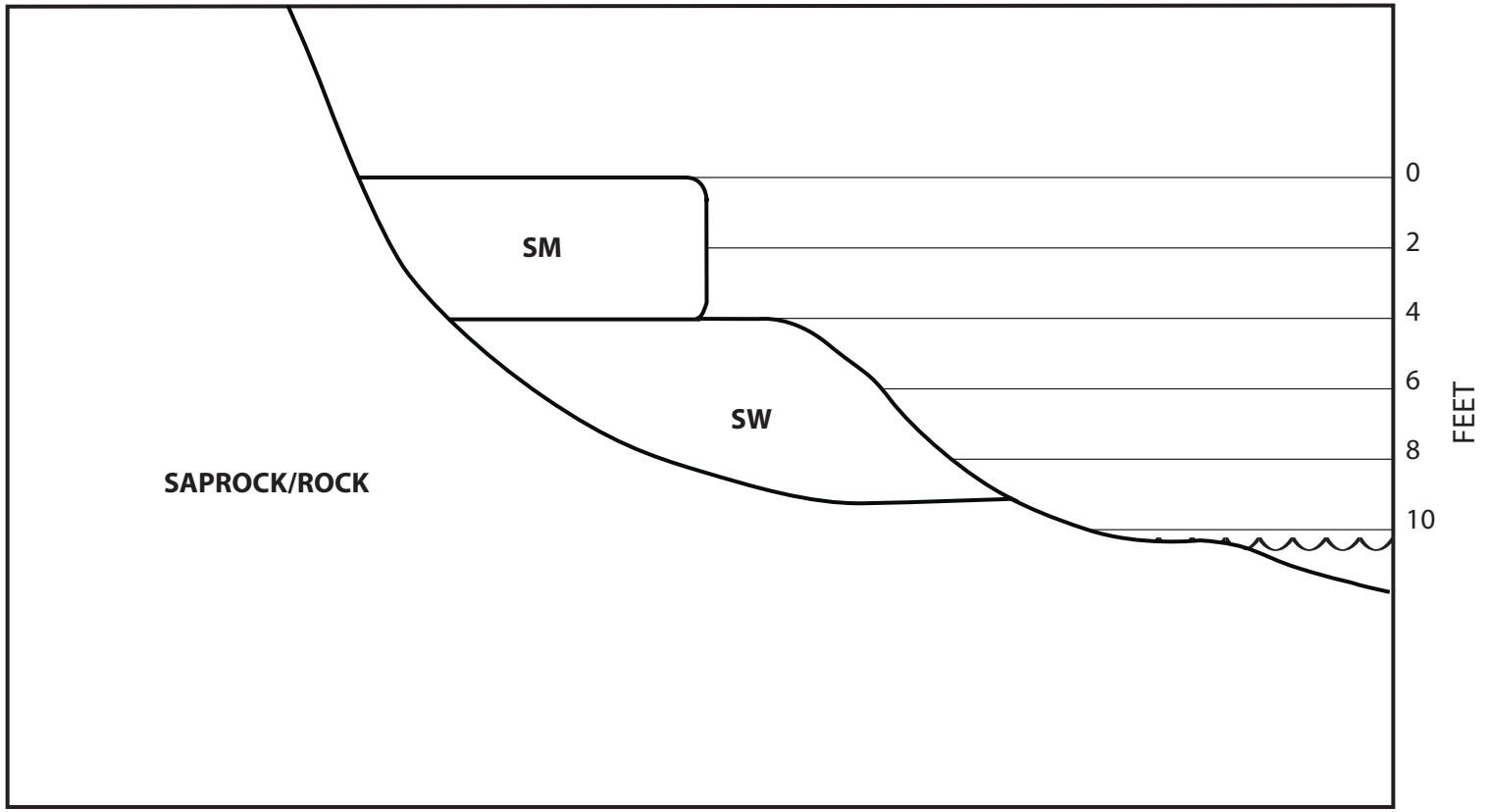
PROJECT : Twelvemile Creek Supplemental Remedial Investigation | LOCATION : Twelvemile Creek - Station 1+00 | LOGGER : Antonio Luna

CONTRACTOR : NA | EXCAVATION EQUIPMENT USED : hand shovel | DATE EXCAVATED: April 25, 2012

APPROX. DIMENS: Length: 14 FT Width: 1-2 FT Max. Height: 10 FT

DEPTH (FT), SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	SIDE WALL PROFILE
SOIL DESCRIPTION	
0-4 SILTY SAND (SM), reddish brown, dry, fine to medium grained sand, non plastic,	
non cohesive	Side wall profiles presented on the following page.
4-9 SAND (SW), yellowish red, dry, fine to coarse grained sand, cross bedding,	
fine layers of silt	
9-10 SAPROCK, BIOTITE GNEISS, yellow	

SIDE WALL PROFILE - SB20



Appendix C
Data Validation Report

Report

Data Validation Report

Supplemental Remedial Investigation

Operable Unit 2 of the

Sangamo Weston, Inc./Twelvemile Creek/Lake Hartwell

Superfund Site

Pickens County, South Carolina

September 2012

Prepared by

CH2MHILL

Contents

Tables

Appendixes

Abbreviations and Acronyms

COC	chain of custody
EDD	electronic data deliverable
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
PCB	polychlorinated biphenyl
QA	quality assurance
QC	quality control
RPD	relative percent difference
TCX	tetrachloro-m-xylene
UFP QAPP	Uniform Federal Policy Quality Assurance Program Project or Project Plan
USEPA	United States Environmental Protection Agency

SECTION 1

Overview

CH2M HILL conducted sampling and analysis activities, soil/sediment sampling, submerged sediment sampling, and multi-incremental soil sampling events at the Sangamo Weston, Inc./Twelvemile Creek/Lake Hartwell Superfund Site in Pickens County, South Carolina. This report describes the validation of analytical data generated under this scope of work. Field teams collected soil environmental samples between April 17, 2012, and May 2, 2012. A summary of the samples collected is shown in Tables 1 through 3.

Samples were delivered to TestAmerica laboratory located in University Park, Illinois, for analytical testing. TestAmerica performed analytical tests for this scope of work including polychlorinated biphenyls (PCBs) analyses by U.S. Environmental Protection Agency (USEPA) Method 3541\3510C\8082A. Soil analyses were also prepared and sub-sampled using the laboratory standard procedure for incremental sampling methodologies by TestAmerica–West Sacramento. After laboratory analyses were completed and reviewed, TestAmerica assembled portable document format laboratory reports and electronic data deliverables (EDDs), which were delivered to the CH2M HILL office located in Chantilly, Virginia.

The data review and validation process is independent of the laboratory's checks; it focuses on the usability of the data to support the project data interpretation and decision making process. Data validation was conducted using the validation criteria outlined in the Uniform Federal Policy Quality Assurance Project Plan (UFP QAPP; (CH2M HILL 2012), and guidance procedures described in USEPA's *National Functional Guidelines for Organic Data Review* (2008a). Analytical methods and laboratory standard operating procedures presented in the UFP QAPP were used to evaluate compliance against quality assurance (QA)/quality control (QC) criteria. If QA/QC criteria were not met, data were considered for qualification. The data qualifiers were those presented in *Data Validation Standard Operation Procedures for Organic Analysis,* Rev. 3.1 (USEPA Region 4, 2008b).The guidelines were not used for data validation; however, the specific qualifiers listed therein may have been applied to data for nonconformances against the QA/QC criteria that have been identified. Data validation qualifiers and qualifiers codes were applied to the hard copy reports and EDD. Ten percent of the EDD results were compared to the hard copy files to verify that the two sources of information matched.

TABLE 1
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample	Laboratory Sample	Date Sampled	Analyses Required
TMC-EB01-04162012		500-45572-1	04/17/2012	[1]
TMC-SB01-0002		500-45572-2	04/17/2012	[1]
TMC-SB01P-0002	TMC-SB01-0002	500-45572-3	04/17/2012	[1]
TMC-SB01-0204		500-45572-4	04/17/2012	[1]
TMC-SB01-0406		500-45572-5	04/17/2012	[1]
TMC-SB01-0608		500-45572-6	04/17/2012	[1]
TMC-SB01-0810		500-45572-7	04/17/2012	[1]
TMC-SB01-1012		500-45572-8	04/17/2012	[1]
TMC-SB01-1214		500-45572-9	04/17/2012	[1]
TMC-SB01-1416		500-45572-10	04/17/2012	[1]
TMC-SB01-1618		500-45572-11	04/17/2012	[1]
TMC-SB01-2224		500-45572-12	04/17/2012	[1]
TMC-SB01-2022		500-45572-13	04/17/2012	[1]
TMC-SB01-1820		500-45572-14	04/17/2012	[1]
TMC-SB01-1717.5-D		500-45572-15	04/17/2012	[1]
TMC-SB02-0002		500-45572-16	04/17/2012	[1]

TABLE 1
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample	Laboratory Sample	Date Sampled	Analyses Required
TMC-SB02-0204		500-45572-17	04/17/2012	[1]
TMC-SB02-0406		500-45572-18	04/17/2012	[1]
TMC-SB02-0608		500-45572-19	04/17/2012	[1]
TMC-SB02-0810		500-45572-20	04/17/2012	[1]
TMC-SB02-1012		500-45573-1	04/17/2012	[1]
TMC-SB02-1214		500-45573-2	04/17/2012	[1]
TMC-SB02-12.513-D		500-45573-3	04/17/2012	[1]
TMC-SB02-1416		500-45573-4	04/17/2012	[1]
TMC-SB02-1618		500-45573-5	04/17/2012	[1]
TMC-SB03-0002		500-45573-6	04/17/2012	[1]
TMC-SB03-0204		500-45573-7	04/17/2012	[1]
TMC-SB03-0406		500-45573-8	04/17/2012	[1]
TMC-SB03-0608		500-45573-9	04/17/2012	[1]
TMC-SB03-0810		500-45573-10	04/17/2012	[1]
TMC-SB03-0995-D		500-45573-11	04/17/2012	[1]
TMC-SB03-1012		500-45573-12	04/17/2012	[1]
TMC-SB03-1214		500-45573-13	04/17/2012	[1]
TMC-SB03-1416		500-45573-14	04/17/2012	[1]
TMC-SB09-0002		500-45645-2	04/19/2012	[1]
TMC-SB09D-0002	TMC-SB09-0002	500-45645-3	04/19/2012	[1]
TMC-SB09-0204		500-45645-4	04/19/2012	[1]
TMC-SB09-0406		500-45645-5	04/19/2012	[1]
TMC-SB09-0608		500-45645-6	04/19/2012	[1]
TMC-SB09-0810		500-45645-7	04/19/2012	[1]
TMC-SB09-1012		500-45645-8	04/19/2012	[1]
TMC-SB09-1010.5-D		500-45645-9	04/19/2012	[1]
TMC-SB07-0002		500-45645-10	04/19/2012	[1]
TMC-SB07P-0002	TMC-SB07-0002	500-45645-11	04/19/2012	[1]
TMC-SB07-0204		500-45645-12	04/19/2012	[1]
TMC-SB07-0406		500-45645-13	04/19/2012	[1]
TMC-SB07-0608		500-45645-14	04/19/2012	[1]
TMC-SB07-0810		500-45645-15	04/19/2012	[1]
TMC-SB07-1011		500-45645-16	04/19/2012	[1]
TMC-SB07-09.510-D		500-45645-17	04/19/2012	[1]
TMC-SB05-0002		500-45645-18	04/19/2012	[1]
TMC-SB05P-0002	TMC-SB05-0002	500-45645-19	04/19/2012	[1]
TMC-SB05-0204		500-45646-1	04/19/2012	[1]
TMC-SB05-0406		500-45646-2	04/19/2012	[1]
TMC-SB05-0608		500-45646-3	04/19/2012	[1]
TMC-SB05-0810		500-45646-4	04/19/2012	[1]

TABLE 1
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample	Laboratory Sample	Date Sampled	Analyses Required
TMC-SB05-09.510-D		500-45646-5	04/19/2012	[1]
TMC-SB05-1012		500-45646-6	04/19/2012	[1]
TMC-SB13-0002		500-45646-7	04/19/2012	[1]
TMC-SB13P-0002	TMC-SB13-0002	500-45646-8	04/19/2012	[1]
TMC-SB13-0204		500-45646-9	04/19/2012	[1]
TMC-SB13-0406		500-45646-10	04/19/2012	[1]
TMC-SB13-0608		500-45646-11	04/19/2012	[1]
TMC-SB13-0810		500-45646-12	04/19/2012	[1]
TMC-SB13-1012		500-45646-13	04/19/2012	[1]
TMC-SB13-1212.5-D		500-45646-14	04/19/2012	[1]
TMC-SB13-1416		500-45646-15	04/19/2012	[1]
TMC-SB13-1618		500-45646-16	04/19/2012	[1]
TMC-SB13-1820		500-45646-17	04/19/2012	[1]
TMC-SB13-19.520-D		500-45646-18	04/19/2012	[1]
TMC-SB15-0002		500-45646-19	04/19/2012	[1]
TMC-SB15-0204		500-45646-20	04/19/2012	[1]
TMC-SB15P-0002	TMC-SB15-0002	500-45647-1	04/19/2012	[1]
TMC-SB15-0406		500-45647-2	04/19/2012	[1]
TMC-SB15-0608		500-45647-3	04/19/2012	[1]
TMC-SB15-0810		500-45647-4	04/19/2012	[1]
TMC-SB15-1414.5D		500-45647-5	04/19/2012	[1]
TMC-SB15-1012		500-45647-6	04/19/2012	[1]
TMC-SB15-1214		500-45647-7	04/19/2012	[1]
TMC-SB15-1416		500-45647-8	04/19/2012	[1]
TMC-SB15-1618		500-45647-9	04/19/2012	[1]
TMC-SB15-1820		500-45647-10	04/19/2012	[1]
TMC-SB15-2022		500-45647-11	04/19/2012	[1]
TMC-SB15-2224		500-45647-12	04/19/2012	[1]
TMC-SB10-0002		500-45647-13	04/20/2012	[1]
TMC-SB10-0002MS	TMC-SB10-0002	500-45647-13MS	04/20/2012	[1]
TMC-SB10-0002MSD	TMC-SB10-0002	500-45647-13MSD	04/20/2012	[1]
TMC-SB10-0204		500-45647-14	04/20/2012	[1]
TMC-SB10-0608		500-45647-15	04/20/2012	[1]
TMC-SB10-0810		500-45647-16	04/20/2012	[1]
TMC-SB10-1012		500-45647-17	04/20/2012	[1]
TMC-SB10-1015.5-D		500-45647-18	04/20/2012	[1]
TMC-SB08-0002		500-45648-1	04/20/2012	[1]
TMC-SB08-0002MS	TMC-SB08-0002	500-45648-1MS	04/20/2012	[1]
TMC-SB08-0002MSD	TMC-SB08-0002	500-45648-1MSD	04/20/2012	[1]

TABLE 1
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample	Laboratory Sample	Date Sampled	Analyses Required
TMC-SB08-0204		500-45648-2	04/20/2012	[1]
TMC-SB08-0406		500-45648-3	04/20/2012	[1]
TMC-SB08-0810		500-45648-4	04/20/2012	[1]
TMC-SB08-1012		500-45648-5	04/20/2012	[1]
TMC-SB08-0608		500-45648-6	04/20/2012	[1]
TMC-SB08-1214		500-45648-7	04/20/2012	[1]
TMC-SB08-1111.5-D		500-45648-8	04/20/2012	[1]
TMC-SB08-1415		500-45648-9	04/20/2012	[1]
TMC-SB10-0406		500-45648-10	04/20/2012	[1]
TMC-EB03-04202012		500-45648-11	04/20/2012	[1]
TMC-SB14-0002		500-45789-1	04/25/2012	[1]
TMC-SB14P-0002	TMC-SB14-0002	500-45789-2	04/25/2012	[1]
TMC-SB14-0204		500-45789-3	04/25/2012	[1]
TMC-SB14-0204MS	TMC-SB14-0204	500-45789-3MS	04/25/2012	[1]
TMC-SB14-0204MSD	TMC-SB14-0204	500-45789-3MSD	04/25/2012	[1]
TMC-SB14-0406		500-45789-4	04/25/2012	[1]
TMC-SB14-0608		500-45789-5	04/25/2012	[1]
TMC-SB14-0810		500-45789-6	04/25/2012	[1]
TMC-SB14-1012		500-45789-7	04/25/2012	[1]
TMC-SB14-1214		500-45789-8	04/25/2012	[1]
TMC-SB14-1416		500-45789-9	04/25/2012	[1]
TMC-SB14-1618		500-45789-10	04/25/2012	[1]
TMC-SB14-1820		500-45789-11	04/25/2012	[1]
TMC-SB14-2022		500-45789-12	04/25/2012	[1]
TMC-SB14P-2022	TMC-SB14-2022	500-45789-13	04/25/2012	[1]
TMC-SB14-2020.5-D		500-45789-14	04/25/2012	[1]
TMC-SB14-2224		500-45789-15	04/25/2012	[1]
TMC-SB14-2426		500-45789-16	04/25/2012	[1]
TMC-SB14-2628		500-45789-17	04/25/2012	[1]
TMC-SB14-2830		500-45789-18	04/25/2012	[1]
TMC-SB14-3031		500-45790-1	04/25/2012	[1]
TMC-SB18-0002		500-45790-2	04/25/2012	[1]
TMC-SB18P-0002	TMC-SB18-0002	500-45790-3	04/25/2012	[1]
TMC-SB18-0204		500-45790-4	04/25/2012	[1]
TMC-SB18-0204MS	TMC-SB18-0204	500-45790-4MS	04/25/2012	[1]
TMC-SB18-0204MSD	TMC-SB18-0204	500-45790-4MSD	04/25/2012	[1]
TMC-SB18-0406		500-45790-5	04/25/2012	[1]
TMC-SB18-0608		500-45790-6	04/25/2012	[1]
TMC-SB18-0810		500-45790-7	04/25/2012	[1]
TMC-SB18-1012		500-45790-8	04/25/2012	[1]

TABLE 1
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample	Laboratory Sample	Date Sampled	Analyses Required
TMC-SB18-1214		500-45790-9	04/25/2012	[1]
TMC-SB18-1416		500-45790-10	04/25/2012	[1]
TMC-SB18-1313.5-D		500-45790-11	04/25/2012	[1]
TMC-SB18-1618		500-45790-12	04/25/2012	[1]
TMC-SB18P-1618	TMC-SB18-1618	500-45790-13	04/25/2012	[1]
TMC-SB18-1819		500-45790-14	04/25/2012	[1]
TMC-SB20-0002		500-45790-15	04/25/2012	[1]
TMC-SB20P-0002	TMC-SB20-0002	500-45790-16	04/25/2012	[1]
TMC-SB20-0406		500-45790-17	04/25/2012	[1]
TMC-SB20-0608		500-45790-18	04/25/2012	[1]
TMC-SB20-0204		500-45791-1	04/25/2012	[1]
TMC-SB20-0204MS	TMC-SB20-0204	500-45791-1MS	04/25/2012	[1]
TMC-SB20-0204MSD	TMC-SB20-0204	500-45791-1MSD	04/25/2012	[1]
TMC-SB20-0810		500-45791-2	04/25/2012	[1]
TMC-SB20-9.510-D		500-45791-3	04/25/2012	[1]
TMC-SB17-1717.5-D		500-45791-4	04/25/2012	[1]
TMC-SB19-0002		500-45791-5	04/25/2012	[1]
TMC-SB19P-0002	TMC-SB19-0002	500-45791-6	04/25/2012	[1]
TMC-SB19-0204		500-45791-7	04/25/2012	[1]
TMC-SB19-0204MS	TMC-SB19-0204	500-45791-7MS	04/25/2012	[1]
TMC-SB19-0204MSD	TMC-SB19-0204	500-45791-7MSD	04/25/2012	[1]
TMC-SB19-0406		500-45791-8	04/25/2012	[1]
TMC-SB19-0608		500-45791-9	04/25/2012	[1]
TMC-SB19-0810		500-45791-10	04/25/2012	[1]
TMC-SB19-1012		500-45791-11	04/25/2012	[1]
TMC-SB19-1214		500-45791-12	04/25/2012	[1]
TMC-SB19-1416		500-45791-13	04/25/2012	[1]
TMC-SB19-1617		500-45791-14	04/25/2012	[1]
TMC-SB19-011.5-D		500-45791-15	04/25/2012	[1]
TMC-SB17-0002		500-45791-16	04/25/2012	[1]
TMC-SB17P-0002	TMC-SB17-0002	500-45792-1	04/25/2012	[1]
TMC-SB17-0204		500-45792-2	04/25/2012	[1]
TMC-SB17-0204MS	TMC-SB17-0204	500-45792-2MS	04/25/2012	[1]
TMC-SB17-0204MSD	TMC-SB17-0204	500-45792-2MSD	04/25/2012	[1]
TMC-SB17-0406		500-45792-3	04/25/2012	[1]
TMC-SB17-0608		500-45792-4	04/25/2012	[1]
TMC-SB17-0810		500-45792-5	04/25/2012	[1]
TMC-SB17-1012		500-45792-6	04/25/2012	[1]
TMC-SB17-1214		500-45792-7	04/25/2012	[1]
TMC-SB17-1416		500-45792-8	04/25/2012	[1]

TABLE 1
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample	Laboratory Sample	Date Sampled	Analyses Required
TMC-SB17-1618		500-45792-9	04/25/2012	[1]
TMC-SB17-1820		500-45792-10	04/24/2012	[1]
TMC-SB04-1416		500-45792-11	04/24/2012	[1]
TMC-SB04-1618		500-45792-12	04/24/2012	[1]
TMC-SB04-1819		500-45792-13	04/24/2012	[1]
TMC-SB04-2224		500-45792-14	04/24/2012	[1]
TMC-SB04-1212.4-D		500-45792-15	04/24/2012	[1]
TMC-EB02-04192012		500-45792-16	04/19/2012	[1]
TMC-SB16-0002		500-45792-17	04/24/2012	[1]
TMC-SB16P-0002	TMC-SB16-0002	500-45792-18	04/24/2012	[1]
TMC-SB06-0002		500-45793-1	04/24/2012	[1]
TMC-SB06P-0002	TMC-SB06-0002	500-45793-2	04/24/2012	[1]
TMC-SB06-0204		500-45793-3	04/24/2012	[1]
TMC-SB06-0204MS	TMC-SB06-0204	500-45793-3MS	04/24/2012	[1]
TMC-SB06-0204MSD	TMC-SB06-0204	500-45793-3MSD	04/24/2012	[1]
TMC-SB06-0406		500-45793-4	04/24/2012	[1]
TMC-SB06-0607		500-45793-5	04/24/2012	[1]
TMC-SB06-0810		500-45793-6	04/24/2012	[1]
TMC-SB06-1012		500-45793-7	04/24/2012	[1]
TMC-SB06-1111.5-D		500-45793-8	04/24/2012	[1]
TMC-SB16-0204		500-45793-9	04/24/2012	[1]
TMC-SB16-0204MS	TMC-SB16-0204	500-45793-9MS	04/24/2012	[1]
TMC-SB16-0204MSD	TMC-SB16-0204	500-45793-9MSD	04/24/2012	[1]
TMC-SB16-0406		500-45793-10	04/24/2012	[1]
TMC-SB16-0608		500-45793-11	04/24/2012	[1]
TMC-SB16-0810		500-45793-12	04/24/2012	[1]
TMC-SB16-1012		500-45793-13	04/24/2012	[1]
TMC-SB16-1214		500-45793-14	04/24/2012	[1]
TMC-SB16-1416		500-45793-15	04/24/2012	[1]
TMC-SB16-1618		500-45793-16	04/24/2012	[1]
TMC-SB04-0002		500-45794-1	04/24/2012	[1]
TMC-SB04P-0002	TMC-SB04-0002	500-45794-2	04/24/2012	[1]
TMC-SB04-0204		500-45794-3	04/24/2012	[1]
TMC-SB04-0204MS		500-45794-3MS	04/24/2012	[1]
TMC-SB04-0204MSD		500-45794-3MSD	04/24/2012	[1]
TMC-SB04-0406		500-45794-4	04/24/2012	[1]
TMC-SB04-0608		500-45794-5	04/24/2012	[1]
TMC-SB04-0810		500-45794-6	04/24/2012	[1]
TMC-SB04-1012		500-45794-7	04/24/2012	[1]
TMC-SB04-1214		500-45794-8	04/24/2012	[1]

TABLE 1
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample	Laboratory Sample	Date Sampled	Analyses Required
TMC-SB16-1820		500-45794-9	04/24/2012	[1]
TMC-SB16-2021		500-45794-10	04/24/2012	[1]
TMC-SB16-14.515-D		500-45794-11	04/24/2012	[1]
TMC-FB01-042612		500-45871-1	04/26/2012	[1]
TMC-EB04-042412		500-45871-2	04/24/2012	[1]
TMC-EB05-042612		500-45871-3	04/26/2012	[1]
TMC-EB06-042612		500-45871-4	04/26/2012	[1]
TMC-EB07-042712		500-45871-5	04/27/2012	[1]
TMC-FB02-042712		500-45871-6	04/27/2012	[1]

Analyses Performed Codes: [1] –PCBs by SW-846 method 8082A

TABLE 2
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample Number	Laboratory Sample ID	Date Sampled	Analyses Required
TMC-SD07-0001		500-46022-1	05/01/2012	[1]
TMC-SDP07-0001	TMC-SD07-0001	500-46022-2	05/01/2012	[1]
TMC-SD01-0001		500-46022-3	05/01/2012	[1]
TMC-SDP01-0001	TMC-SD01-0001	500-46022-4	05/01/2012	[1]
TMC-SD02-0001		500-46022-5	05/01/2012	[1]
TMC-SDP02-0001	TMC-SD02-0001	500-46022-6	05/01/2012	[1]
TMC-SD03-0001		500-46022-7	05/01/2012	[1]
TMC-SDP03-0001	TMC-SD03-0001	500-46022-8	05/01/2012	[1]
TMC-SD04-0001		500-46022-9	05/01/2012	[1]
TMC-SDP04-0001	TMC-SD04-0001	500-46022-10	05/01/2012	[1]
TMC-SD05-0001		500-46022-11	05/01/2012	[1]
TMC-SD05-0001MS	TMC-SD05-0001	500-46022-11MS	05/01/2012	[1]
TMC-SD05-0001MSD	TMC-SD05-0001	500-46022-11MSD	05/01/2012	[1]
TMC-SD06-0001		500-46022-12	05/01/2012	[1]
TMC-SD08-0001		500-46022-13	05/01/2012	[1]
TMC-SD09-0001		500-46022-14	05/01/2012	[1]
TMC-SD10-0001		500-46022-15	05/01/2012	[1]
TMC-EB08-050112		500-46022-16	05/01/2012	[1]
TMC-FB03-050112		500-46022-17	05/01/2012	[1]
TMC-EB09-050212		500-46026-1	05/02/2012	[1]
TMC-SD11-0001		500-46026-2	05/02/2012	[1]
TMC-SD12-0001		500-46026-3	05/02/2012	[1]
TMC-SD13-0001		500-46026-4	05/02/2012	[1]
TMC-SD14-0001		500-46026-5	05/02/2012	[1]

Analyses Performed Codes: [1] –PCBs by SW-846 method 8082A

TABLE 3
Summary Sample Data
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Sample Number	Reference Sample	Laboratory Sample ID	Date Sampled	Analyses Required
TMC-DU01		500-46322-1	04/26/2012	[1]
TMC-DU02		500-46322-4	04/26/2012	[1]
TMC-DU02MS	TMC-DU02	500-46322-4MS	04/26/2012	[1]
TMC-DU02MSD	TMC-DU02	500-46322-4MSD	04/26/2012	[1]
TMC-DU03		500-46322-5	04/27/2012	[1]
TMC-DU04		500-46322-6	04/27/2012	[1]
TMC-DU04-T	TMC-DU04	500-46322-7	04/27/2012	[1]
TMC-DU04-TT	TMC-DU04	500-46322-8	04/27/2012	[1]
TMC-DU05		500-46322-9	04/27/2012	[1]
TMC-DU06-050112		500-46322-10	05/01/2012	[1]

Analyses Performed Codes: [1] –PCBs by SW-846 method 8082A

1.1 Summary of Sample Analyses

No major issues were identified as a result of data validation. Minor issues are described in the following section. Project data qualifiers are added to the laboratory reports. A list of project data qualifiers is shown in Table 4. A list of qualifier codes and their definitions is shown in Table 5.

Field samples are qualified for the introduction of contaminants resulting from laboratory and field activities as measured in the method blank, equipment rinse blank, field blank, and trip blank audit samples. When present, equipment rinse blank, field blank, and trip blank audit samples are not qualified.

TABLE 4
Project Qualifiers
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Qualifier	Definition
U	Not detected or not detected at significantly greater than that in an associated blank.
UJ	Not detected. Reporting limit is estimated.
J	Estimated. The analyte was detected but the concentration is estimated.
R	Rejected. The data point was rejected and may not be used for decision making.

TABLE 5
Project Qualifier Codes
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Code	Definition
2SH	Second Source Accuracy High
2SL	Second Source Accuracy Low
BD	Blank Spike/Blank Spike Duplicate (laboratory control sample [LCS]/laboratory control sample duplicate [LCSD]) Precision
BL	Blank
BSH	Blank Spike/LCS Recovery High
BSL	Blank Spike/LCS Recovery Low
CA	Carryover Suspected
CCH	Continuing Calibration Verification Accuracy High
CCL	Continuing Calibration Verification Accuracy Low
CRL	Certified Reference Material Low
DL	Dilution
FD	Field Duplicate
HT	Holding Time
ICH	Initial Calibration High
ICL	Initial Calibration Low
ISH	Internal Standard Area Response High
ISL	Internal Standard Area Response Low
LR	Linear Range (Exceeded calibration range)
MD	Matrix Spike/Matrix Spike Duplicate Precision
MSH	Matrix Spike and/or Matrix Spike Duplicate Recovery High
MSL	Matrix Spike and/or Matrix Spike Duplicate Recovery Low
OT	Other
RE	Re-extraction
SSH	Spiked Surrogate Recovery High
SSL	Spiked Surrogate Recovery Low
TN	Tune
LD	Laboratory Duplicate

SECTION 2

Technical Issues

2.1 Major Technical Issues

No major technical issues were identified.

2.2 Minor Technical Issues for Polychlorinated Biphenyls Analyses—Soil/Sediment Sampling

2.2.1 Sample Login, Preservation, and Holding Time

All samples were received in good condition, properly preserved, and correctly labeled, except as noted below.

Job Number 500-45645-1: The laboratory noted that samples TMC-EB02-04192012 and TMC-SB09-11.512 were listed on the chain of custody (COC) for samples received on April 21, 2012; however, the samples were not received by the laboratory and could not be logged in for analysis under this job number. Sample TMC-EB02-04192012 was analyzed under job number 500-45792-1. Sample TMC-SB09-11.512 was never collected.

Job Number 500-45648-1: The laboratory noted that there were three samples (TMC-SB08-1111.5, TMC-SB08-1415, and TMC-SB10-0406) that were received at the laboratory on April 21, 2012, but were not listed on the COC. The samples were added to the COC and logged in for analysis. The laboratory subsequently received the last page of the COC by e-mail, and there were three additional samples listed on the last page as well. The first sample, TMC-SB08-1415, collected on April 20, 2012, at 11:22 was already logged in for analysis. Sample TMC-EB03-04202012 collected on April 20, 2012, was received and logged in for analysis. Sample TMC-SB08-0000.5D was shipped to a different laboratory and was not logged in for analysis at that laboratory.

Job Number 500-45792-1: The laboratory noted that sample TMC-SB08-1415 was listed on the COC received on April 27, 2012; however, the laboratory did not receive the sample, and it could not be logged in for analysis under this job number. Sample TMC-SB08-1415 was analyzed under job number 500-45648-1. Also, the COC for the equipment blank sample had the sample ID listed as TMC-EB03-04202012 collected on April 20, 2012, at 13:20. The bottle label for this sample was reported as TMC-EB02-04192012 collected on April 29, 2012, at 08:00. Per the laboratory, the EB03 sample was already received and logged under job 500-45648-1. Therefore, the EB sample received on April 27, 2012, was noted as the equipment blank sample that was held at the trailer. The sample was then logged in as the EB02 sample with the label date and time from the bottle. Also, per the project chemist's instructions, the sample was extracted and analyzed outside the technical holding time.

2.2.2 Calibrations

Initial, second-source, and continuing calibration verification procedures and performance were acceptable. The laboratory case narratives note some deficiencies on the confirmation column (high bias) for the continuing calibration verifications; however, all percent difference recoveries on the primary columns were within criteria, and all sample results were reported from the primary columns. Also, the percent difference for the decachlorobiphenyl surrogate was reported as bias high for the continuing calibration verification on some of the primary columns; however, all decachlorobiphenyl surrogate recoveries for the associated samples were within acceptable limits, and therefore, no qualifiers were required.

2.2.3 Blank Contaminants

There were no detections in the equipment, field, and method blank samples.

2.2.4 Laboratory Control Sample Analysis

LCSs were prepared and analyzed with each sample preparation batch and analytical run. Laboratory accuracy objectives were met for all LCS samples.

2.2.5 Primary/Second Column Confirmation

The positive result for PCB-1248 for sample TMC-SB19-011.5-D should be considered a quantitative estimate. The relative percent difference (RPD) between the results from the primary and confirmatory column analyses was greater than the acceptance criterion of 40 percent for this compound. The positive result for PCB-1248 for sample TMC-SB19-011.5-D has been qualified as "J" in the data summary table, with a validation note of "PC" to indicate that it is a quantitative estimate.

2.2.6 Matrix Spike and Spike Duplicate Analyses

Matrix spike and spike duplicate samples were collected and analyzed using the field samples noted in Table 6.

TABLE 6
Matrix Spike and Matrix Spike Duplicate Recovery Out of QC Limits: PCB
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

QC Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Qualifiers Applied
Matrix Spike	PCB-1260	171%	60-130	TMC-SB10-0002	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		169%			
Matrix Spike	PCB-1248	240%	50-120	TMC-SB10-0002	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		243%			
Matrix Spike	PCB-1248	155%	50-120	TMC-SB08-0002	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		154%			
Matrix Spike	PCB-1016	NA	40-140	TMC-SB14-0204	Accuracy and precision objectives could not be evaluated due the fact that native amounts of PCB-1248 and PCB-1254 exceeded 4 times the amount fortified in the sample. The recovery data are inconclusive, and no action was taken to qualify the results.
Matrix Spike Duplicate	PCB-1248	NA	50-120		
	PCB-1254	NA	50-120		
	PCB-1260	NA	60-130		
Matrix Spike	PCB-1260	152%	60-130	TMC-SB18-0204	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		147%			
Matrix Spike	PCB-1260	141%	60-130	TMC-SB20-0204	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike	PCB-1016	NA	40-140	TMC-SB17-0204	Accuracy and precision objectives could not be evaluated due to the fact that native amounts of PCB-1248 and PCB-1254 exceeded 4 times the amount fortified in the sample. The recovery data are inconclusive, and no action was taken to qualify the results.
Matrix Spike Duplicate	PCB-1248	NA	50-120		
	PCB-1254	NA	50-120		
	PCB-1260	NA	60-130		
Matrix Spike	PCB-1254	37%	50-120	TMC-SB06-0204	LCS and matrix spike duplicate recoveries were within limits; therefore, no qualifier is required.

TABLE 6
Matrix Spike and Matrix Spike Duplicate Recovery Out of QC Limits: PCB
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

QC Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Qualifiers Applied
Matrix Spike Duplicate	PCB-1016	175%	40-140	TMC-SB06-0204	LCS and matrix spike recoveries were within limits, and the sample result was nondetect; therefore, no qualifier is required.
Matrix Spike	PCB-1260	209%	60-130	TMC-SB06-0204	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		196%			
Matrix Spike	PCB-1248	339%	50-120	TMC-SB06-0204	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		235%			
		Relative Percent Difference - 32	30		
Matrix Spike Duplicate	PCB-1016	164%	40-140	TMC-SB16-0204	LCS and matrix spike recoveries were within limits, and the sample result was nondetect; therefore, no qualifier is required.
Matrix Spike	PCB-1260	142%	60-130	TMC-SB16-0204	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		155%			
Matrix Spike Duplicate	PCB-1248	281%	50-120	TMC-SB16-0204	LCS and matrix spike recoveries were within limits, and the sample result was nondetect; therefore, no qualifier is required.
		Relative Percent Difference - 93	30		
Matrix Spike	PCB-1260	187%	60-130	TMC-SB04-0204	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		182%			
Matrix Spike	PCB-1016	190%	40-140	TMC-SB04-0204	Sample result was nondetect; therefore, no qualifier is required.
Matrix Spike Duplicate		173%			
Matrix Spike	PCB-1254	127%	50-120	TMC-SB04-0204	LCS and matrix spike duplicate recoveries were within limits; therefore, no qualifier is required.

2.2.7 Surrogate Analyses

All surrogate recoveries were within acceptable quality control limits, except as noted in Table 7.

TABLE 7
Surrogate Recoveries Out of QC Limits: PCB
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

SDG	Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Flag
500-45572-1	TMC-SB01-1012	Tetrachloro-m-xylene	120%	50-116	TMC-SB01-1012	Detects-J
500-45572-1	TMC-SB01-1618	Tetrachloro-m-xylene	131%	50-116	TMC-SB01-1618	Detects-J

TABLE 7
Surrogate Recoveries Out of QC Limits: PCB
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

SDG	Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Flag
500-45572-1	TMC-SB01-2022	Tetrachloro-m-xylene	241%	50-116	TMC-SB01-2022	Detects-J
500-45573-1	TMC-SB02-1618	Tetrachloro-m-xylene	538%	50-116	TMC-SB02-1618	Detects-J
500-45573-1	TMC-SB03-1416	Tetrachloro-m-xylene	772%	50-116	TMC-SB03-1416	Detects-J
500-45645-1	TMC-SB09-0406	Tetrachloro-m-xylene	39%	50-116	TMC-SB09-0406	Nondetects-UJ
		Decachlorobiphenyl	54%	60-125		Detects-J
500-45645-1	TMC-SB09-0608	Tetrachloro-m-xylene	137%	50-116	TMC-SB09-0608	Detects-J
		Decachlorobiphenyl	141%	60-125		
500-45645-1	TMC-SB09-1012	Tetrachloro-m-xylene	191%	50-116	TMC-SB09-1012	Detects-J
500-45645-1	TMC-SB09-1010.5-D	Tetrachloro-m-xylene	556%	50-116	TMC-SB09-1010.5-D	Detects-J
500-45645-1	TMC-SB07-0810	Tetrachloro-m-xylene	442%	50-116	TMC-SB07-0810	Detects-J
500-45645-1	TMC-SB07-09.510-D	Tetrachloro-m-xylene	146%	50-116	TMC-SB07-09.510-D	Detects-J
500-45646-1	TMC-SB05-0608	Tetrachloro-m-xylene	251%	50-116	TMC-SB05-0608	Detects-J
500-45646-1	TMC-SB05-0810	Tetrachloro-m-xylene	421%	50-116	TMC-SB05-0810	Detects-J
		Decachlorobiphenyl	144%	60-125		
500-45646-1	TMC-SB05-09.510-D	Tetrachloro-m-xylene	383%	50-116	TMC-SB05-09.510-D	Nondetects-UJ
		Decachlorobiphenyl	28%	60-125		Detects-J
500-45646-1	TMC-SB05-1012	Tetrachloro-m-xylene	375%	50-116	TMC-SB05-1012	Detects-J
500-45646-1	TMC-SB13-0406	Tetrachloro-m-xylene	121%	50-116	TMC-SB13-0406	Detects-J
500-45646-1	TMC-SB13-0810	Decachlorobiphenyl	54%	60-125	TMC-SB13-0810	Nondetects-UJ Detects-J
500-45646-1	TMC-SB13-1416	Tetrachloro-m-xylene	1140%	50-116	TMC-SB13-1416	Detects-J
500-45647-1	TMC-SB15-1414.5-D	Tetrachloro-m-xylene	137%	50-116	TMC-SB15-1414.5-D	Detects-J
500-45647-1	TMC-SB15-1214	Tetrachloro-m-xylene	538%	50-116	TMC-SB15-1214	Detects-J
		Decachlorobiphenyl	151%	60-125		
500-45647-1	TMC-SB15-1416	Tetrachloro-m-xylene	136%	50-116	TMC-SB15-1416	Detects-J
		Decachlorobiphenyl	137%	60-125		
500-45647-1	TMC-SB10-0810	Tetrachloro-m-xylene	134%	50-116	TMC-SB10-0810	Detects-J
500-45647-1	TMC-SB10-1012	Tetrachloro-m-xylene	425%	50-116	TMC-SB10-1012	Detects-J
500-45647-1	TMC-SB10-1010.5-D	Tetrachloro-m-xylene	750%	50-116	TMC-SB10-1010.5-D	Detects-J
500-45789-1	TMC-SB14-0406	Tetrachloro-m-xylene	44%	50-116	TMC-SB14-0406	Nondetects-UJ Detects-J
500-45789-1	TMC-SB14-0810	Tetrachloro-m-xylene	42%	50-116	TMC-SB14-0810	Nondetects-UJ Detects-J

TABLE 7
Surrogate Recoveries Out of QC Limits: PCB
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

SDG	Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Flag
500-45789-1	TMC-SB14-1012	Tetrachloro-m-xylene	49%	50-116	TMC-SB14-1012	Nondetects-UJ Detects-J
500-45789-1	TMC-SB14-1214	Tetrachloro-m-xylene	48%	50-116	TMC-SB14-1214	Nondetects-UJ Detects-J
500-45789-1	TMC-SB14-1416	Tetrachloro-m-xylene	40%	50-116	TMC-SB14-1416	Nondetects-UJ Detects-J
500-45789-1	TMC-SB14-2020.5-D	Tetrachloro-m-xylene Decachlorobiphenyl	121% 128%	50-116 60-125	TMC-SB14-2020.5-D	Detects-J
500-45789-1	TMC-SB14-2628	Tetrachloro-m-xylene	144%	50-116	TMC-SB14-2628	Detects-J
500-45790-1	TMC-SB18-1313.5-D	Tetrachloro-m-xylene	125%	50-116	TMC-SB18-1313.5-D	Detects-J
500-45791-1	TMC-SB19-1214	Decachlorobiphenyl	126%	60-125	TMC-SB19-1214	Detects-J
500-45792-1	TMC-SB17-1214	Tetrachloro-m-xylene	438%	50-116	TMC-SB17-1214	Detects-J
500-45792-1	TMC-SB04-1819	Tetrachloro-m-xylene	229%	50-116	TMC-SB04-1819	Detects-J
500-45792-1	TMC-SB04-1212.4-D	Decachlorobiphenyl	53%	60-125	TMC-SB04-1212.4-D	Nondetects-UJ
500-45793-1	TMC-SB06-0406	Tetrachloro-m-xylene	117%	50-116	TMC-SB06-0406	Detects-J
500-45793-1	TMC-SB06-1012	Tetrachloro-m-xylene	273%	50-116	TMC-SB06-1012	Detects-J
500-45793-1	TMC-SB06-1111.5-D	Tetrachloro-m-xylene Decachlorobiphenyl	365% 59%	50-116 60-125	TMC-SB06-1111.5-D	Nondetects-UJ Detects-J
500-45793-1	TMC-SB16-1012	Tetrachloro-m-xylene Decachlorobiphenyl	1647% 128%	50-116 60-125	TMC-SB16-1012	Detects-J
500-45793-1	TMC-SB16-1214	Tetrachloro-m-xylene	228%	50-116	TMC-SB16-1214	Detects-J
500-45793-1	TMC-SB16-1416	Tetrachloro-m-xylene Decachlorobiphenyl	3670% 140%	50-116 60-125	TMC-SB16-1416	Detects-J
500-45793-1	TMC-SB16-1618	Decachlorobiphenyl	50%	60-125	TMC-SB16-1618	Nondetects-UJ
500-45794-1	TMC-SB04-0406	Tetrachloro-m-xylene	410%	50-116	TMC-SB04-0406	Detects-J
500-45794-1	TMC-SB04-0608	Tetrachloro-m-xylene	140%	50-116	TMC-SB04-0608	Detects-J

Due to the fact that surrogate recoveries were outside the acceptable limits that are listed in Table 7, the results for the samples listed in the table were qualified as estimated with a “J” for detects or with a “UJ” for nondetects, with a validation note of “SSH” for high recovery or “SSL” for low recovery. The laboratory noted that evidence of matrix interference was present; therefore, re-extraction and/or re-analysis were not performed. For samples with a validation note of “OT,” neither a low bias nor high bias address the root cause for the exceedances noted; therefore, sample heterogeneity is suspected.

2.2.7.1 Field Duplicates

Field samples TMC-SB01-0002, TMC-SB09-0002, TMC-SB07-0002, TMC-SB05-0002, TMC-SB13-0002, TMC-SB15-0002, TMC-SB14-0002, TMC-SB14-2022, TMC-SB18-0002, TMC-SB18-1618, TMC-SB20-0002, TMC-SB19-0002, TMC-SB17-0002, TMC-SB16-0002, TMC-SB06-0002, and TMC-SB04-0002 were collected and analyzed in duplicate. Field duplicate precision objectives were not met for the samples listed below, and were qualified as estimated "J."

Compound	Affected Samples	Relative Percent Difference
PCB-1254	TMC-SB13-0002 and TMC-SB13P-0002	150%

Field duplicate precision could not be calculated for the following samples.

Compound	Affected Samples	Results (micrograms per kilogram)
PCB-1248	TMC-SB15-0002/TMC-SB15P-0002	9U / 130
PCB-1248	TMC-SB13-0002/TMC-SB13P-0002	10U / 1500
PCB-1248	TMC-SB04-0002/TMC-SB04P-0002	50U / 380

Sample heterogeneity is suspected due to field duplicate imprecision.

2.2.7.2 Dilutions

The samples presented were analyzed at the dilutions noted in the table below. The dilutions were required to prevent saturation of the instrument, to allow quantitation of the compounds within the linear range of the calibration curve, and/or to reduce the effects of the matrix on the target compounds. Some of the dilutions noted resulted in surrogate compounds being diluted below the instrument detection limit; therefore, surrogate recoveries were not reported for all diluted analysis.

Sample ID	Analysis	Dilution Factor
TMC-SB01-0204	PCB	5x
TMC-SB01-0406	PCB	5x
TMC-SB01-0608	PCB	5x
TMC-SB01-0810	PCB	5x
TMC-SB01-1012	PCB	10x
TMC-SB01-1618	PCB	10x
TMC-SB01-2224	PCB	20x
TMC-SB01-2022	PCB	10x
TMC-SB01-1717.5-D	PCB	20x
TMC-SB02-0002	PCB	10x
TMC-SB02-0204	PCB	10x
TMC-SB02-0810	PCB	10x
TMC-SB02-1012	PCB	20x
TMC-SB02-1214	PCB	10x

Sample ID	Analysis	Dilution Factor
TMC-SB02-12.513-D	PCB	10x
TMC-SB02-1416	PCB	10x
TMC-SB02-1618	PCB	10x
TMC-SB03-0002	PCB	5x
TMC-SB03-0204	PCB	5x
TMC-SB03-0406	PCB	5x
TMC-SB03-0810	PCB	20x
TMC-SB03-0995-D	PCB	50x
TMC-SB03-1012	PCB	2x
TMC-SB03-1214	PCB	20x
TMC-SB03-1416	PCB	10x
TMC-SB09-0002	PCB	5x
TMC-SB09D-0002	PCB	5x
TMC-SB09-0204	PCB	10x
TMC-SB09-0608	PCB	5x
TMC-SB09-1012	PCB	2x
TMC-SB09-1010.5-D	PCB	5x
TMC-SB07-0002	PCB	100x
TMC-SB07P-0002	PCB	100x
TMC-SB07-0204	PCB	20x
TMC-SB07-0406	PCB	5x
TMC-SB07-0810	PCB	10x
TMC-SB07-1011	PCB	2x
TMC-SB07-09.510-D	PCB	5x
TMC-SB05-0406	PCB	2x
TMC-SB05-0608	PCB	5x
TMC-SB05-0810	PCB	5x
TMC-SB05-09.510-D	PCB	2x
TMC-SB05-1012	PCB	5x
TMC-SB13P-0002	PCB	5x
TMC-SB13-0204	PCB	20x
TMC-SB13-0406	PCB	10x
TMC-SB13-1416	PCB	10x
TMC-SB13-19.520-D	PCB	2x
TMC-SB15-0810	PCB	5x
TMC-SB15-1414.5D	PCB	5x
TMC-SB15-1012	PCB	200x
TMC-SB15-1214	PCB	10x
TMC-SB15-1416	PCB	5x
TMC-SB10-0002	PCB	2x
TMC-SB10-0608	PCB	5x
TMC-SB10-1012	PCB	10x
TMC-SB10-1010.5-D	PCB	10x
TMC-SB08-0204	PCB	5x

Sample ID	Analysis	Dilution Factor
TMC-SB08-0810	PCB	2x
TMC-SB08-1012	PCB	2x
TMC-SB08-0608	PCB	2x
TMC-SB10-0406	PCB	5x
TMC-SB14-0002	PCB	2x
TMC-SB14P-0002	PCB	2x
TMC-SB14-0204	PCB	20x
TMC-SB14-1618	PCB	5x
TMC-SB14-1820	PCB	5x
TMC-SB14-2022	PCB	5x
TMC-SB14P-2022	PCB	5x
TMC-SB14-2020.5-D	PCB	10x
TMC-SB14-2628	PCB	5x
TMC-SB14-2830	PCB	20x
TMC-SB18-0204	PCB	2x
TMC-SB18-1214	PCB	20x
TMC-SB18-1416	PCB	2x
TMC-SB18-1313.5-D	PCB	5x
TMC-SB20-9.510-D	PCB	2x
TMC-SB17-1717.5-D	PCB	2x
TMC-SB19-0406	PCB	20x
TMC-SB19-0608	PCB	100x
TMC-SB19-0810	PCB	100x
TMC-SB19-1012	PCB	10x
TMC-SB19-1214	PCB	10x
TMC-SB19-1416	PCB	2x
TMC-SB19-011.5-D	PCB	2x
TMC-SB17-0002	PCB	10x
TMC-SB17P-0002	PCB	20x
TMC-SB17-0204	PCB	20x
TMC-SB17-0406	PCB	100x
TMC-SB17-0608	PCB	10x
TMC-SB17-0810	PCB	10x
TMC-SB17-1012	PCB	10x
TMC-SB17-1214	PCB	10x
TMC-SB17-1416	PCB	10x
TMC-SB17-1618	PCB	2x
TMC-SB17-1820	PCB	20x
TMC-SB04-1819	PCB	10x
TMC-SB16-0002	PCB	2x
TMC-SB16P-0002	PCB	5x
TMC-SB06-0204	PCB	5x
TMC-SB06-0406	PCB	10x
TMC-SB06-0607	PCB	20x

Sample ID	Analysis	Dilution Factor
TMC-SB06-1012	PCB	10x
TMC-SB06-1111.5-D	PCB	5x
TMC-SB16-0204	PCB	2x
TMC-SB16-0406	PCB	20x
TMC-SB16-1012	PCB	10x
TMC-SB16-1214	PCB	10x
TMC-SB16-1416	PCB	10x
TMC-SB04-0002	PCB	5x
TMC-SB04P-0002	PCB	2x
TMC-SB04-0204	PCB	5x
TMC-SB04-0406	PCB	10x
TMC-SB04-0608	PCB	10x
TMC-SB04-0810	PCB	5x
TMC-SB16-14.515-D	PCB	20x

2.3 Minor Technical Issues for PCBs Analyses—Submerged Sediment Sampling

2.3.1 Sample Login, Preservation, and Holding Time

All samples were received in good condition, properly preserved, and correctly labeled.

2.3.2 Calibrations

Initial, second-source, and continuing calibration procedures and performance were acceptable.

2.3.3 Blank Contaminants

There were no detections in the equipment, field, and method blank samples.

2.3.4 Laboratory Control Sample Analysis

LCSs were prepared and analyzed with each sample preparation batch and analytical run. Laboratory accuracy objectives were met for all LCS samples.

2.3.5 Matrix Spike and Spike Duplicate Analyses

A matrix spike and spike duplicate sample were collected and analyzed using field sample TMC-SD05-0002. The matrix spike/matrix spike duplicate accuracy and precision objectives were met.

2.3.6 Surrogate Analyses

All surrogate recoveries were within acceptable QC limits, except as noted in Table 8.

TABLE 8
Surrogate Recoveries Out of QC Limits: PCB
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

SDG	Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Flag
500-46022-1	TMC-SDP03-0001	Tetrachloro-m-xylene	133%	50-116	TMC-SDP03-0001	Detects-J
500-46022-1	TMC-SD10-0001	Tetrachloro-m-xylene	48%	50-116	TMC-SD10-0001	Nondetects-UJ

Due to the fact that surrogate recoveries were outside the acceptable limits that are listed in Table 8, the results for the samples listed in the table were qualified as estimated with a "J" for detects or with a "UJ" for nondetects, with a validation note of "SSH" for high recovery or "SSL" for low recovery. The laboratory noted that evidence of matrix interference was present; therefore, re-extraction and/or re-analysis were not performed.

2.3.7 Field Duplicates

Field samples TMC-SD07-0001, TMC-SD01-0001, TMC-SD02-0001, TMC-SD03-0001, and TMC-SD04-0001 were collected and analyzed in duplicate. Field duplicate precision objectives were not met for the samples listed below, and were qualified as estimated "J."

Compound	Affected Samples	Relative Percent Difference
PCB-1254	TMC-SD07-0001 and TMC-SDP07-0001	60.16%
PCB-1248	TMC-SD03-0001 and TMC-SDP03-0001	69.39%
PCB-1254	TMC-SD03-0001 and TMC-SDP03-0001	70.97%

Field duplicate precision could not be calculated for the following samples.

Compound	Affected Samples	Results (µg/kg)
PCB-1248	TMC-SD07-0001/TMC-SDP07-0001	11U / 240

Sample heterogeneity is suspected due to field duplicate imprecision.

2.4 Minor Technical Issues for PCBs Analyses—Multi-incremental Sampling

2.4.1 Sample Login, Preservation, and Holding Time

All samples were received in good condition, properly preserved, and correctly labeled. The multi-incremental laboratory preparation, certified reference material, laboratory replicates, and sample preparations were subcontracted to TestAmerica–West Sacramento, and all samples were air-dried and sieved per the procedure. TestAmerica–West Sacramento reported their laboratory sample IDs on the forms and in the EDD instead of the field sample IDs. On, May 31, 2012, the project chemist instructed the laboratory to issue a cross reference table for association of the field sample IDs to the laboratory sample IDs.

2.4.2 Calibrations

Initial, second-source, and continuing calibration procedures and performance were acceptable.

2.4.3 Blank Contaminants

There were no detections in the grinding blank and method blank samples.

2.4.4 Laboratory Control Sample Analysis

LCSs were prepared and analyzed with each sample preparation batch and analytical run. Laboratory accuracy objectives were met for all LCS samples.

2.4.5 Certified Reference Material

The certified reference material recoveries were outside acceptable QC limits as noted in Table 9.

TABLE 9
CRM Recovery Out of QC Limits: PCB
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

QC Sample	Parameter	Recovery	Recovery Limits	Associated Samples	Qualifiers Applied (Please note that qualifiers were applied to all PCBs)
Certified reference material	PCB-1016	17%	40-140	TMC-DU01 TMC-DU01 DUP TMC-DU01 TRIP TMC-DU02 TMC-DU03 TMC-DU04 TMC-DU04-T TMC-DU04-TT TMC-DU05 TMC-DU06-050112	Nondetects-UJ Detects-J
Certified reference material	PCB-1260	40%	60-130	TMC-DU01 TMC-DU01 DUP TMC-DU01 TRIP TMC-DU02 TMC-DU03 TMC-DU04 TMC-DU04-T TMC-DU04-TT TMC-DU05 TMC-DU06-050112	Nondetects-UJ Detects-J

Due to the fact that certified reference material recoveries were outside the acceptable limits that are listed in Table 9, the results for the samples listed in the table were qualified as estimated with a “J” for detects or with a “UJ” for nondetects with a validation note of “CRL” for low percent recovery.

2.4.6 Matrix Spike and Spike Duplicate Analyses

A matrix spike and spike duplicate sample were collected and analyzed using field sample TMC-DU02. The matrix spike/matrix spike duplicate accuracy and precision objectives were met.

2.4.7 Surrogate Analyses

All surrogate recoveries were within acceptable quality control limits, except for tetrachloro-m-xylene (TCX) for the Grinding Blank Composite 45 percent (50-116). Since the TCX recoveries for all associated samples and remaining QC samples were within criteria, no action was taken to qualify the samples.

2.4.8 Laboratory Duplicate

Sample TMC-DU01 was collected and analyzed in duplicates. Field duplicate precision objectives were met.

2.4.9 Laboratory Triplicate

Sample TMC-DU01 was collected and analyzed in triplicates. Field triplicate precision objectives were met.

Compound	Affected Samples	Percent Relative Standard Deviation
PCB-1248	TMC-DU01	4.33%
PCB-1254	TMC-DU01	4.33%

2.4.10 Field Triplicate

Field sample TMC-DU04 were collected and analyzed in triplicates. Field triplicate precision objectives were met.

Compound	Affected Samples	Percent Relative Standard Deviation
PCB-1248	TMC-DU04	34.05%
PCB-1254	TMC-DU04	20.86%

SECTION 3

Data Usability

Data reviewed in this report meet the data quality goals stated in the project UFP QAPP. The data user can use 100 percent of the data recognizing the potential data biases indicated by the data qualifiers assigned to some results. Data were qualified for a subset of results based on low and/or high surrogate recoveries and field duplicate imprecision biases.

SECTION 4

References

CH2M HILL. 2012. *Uniform Federal Policy Quality Assurance Project Plan, Twelvemile Creek Site, Pickens County, South Carolina*. April.

U.S. Environmental Protection Agency (USEPA). 2008a. *National Functional Guidelines for Organic Data Review*.

U.S. Environmental Protection Agency (USEPA), Region 4. 2008b. *Data Validation Standard Operation Procedures for Organic Analysis.* Rev. 3.1. August.

Appendix A of Appendix C
Validated Laboratory Reports and Chain-of-Custody Forms

Validated laboratory reports and chain-of-custody forms are provided on the accompanying CD.

Appendix B of Appendix C
Data Validation Checklists

Data validation checklists are provided on the accompanying CD.

Appendix D
Analytical Data

Appendix D - Table 1
Submerged Sediment Sample Results
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Location	SD01		SD02		SD03	
Sample ID	TMC-SD01-0001	TMC-SDP01-0001	TMC-SD02-0001	TMC-SDP02-0001	TMC-SD03-0001	TMC-SDP03-0001
Sample Date	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012
Sample Depth (ft)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Sample Type	N	FD	N	FD	N	FD
Analyte (mg/kg)						
PCB-1016	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
PCB-1221	0.017 U	0.017 U	0.018 U	0.018 U	0.017 U	0.017 U
PCB-1232	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
PCB-1242	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U
PCB-1248	**0.035 J**	**0.064**	0.011 U	0.011 U	**0.16 J**	**0.33 J**
PCB-1254	**0.058**	**0.037 J**	**0.022 J**	**0.038 J**	**0.1 J**	**0.21 J**
PCB-1260	0.01 U	0.011 U	0.011 U	0.011 U	0.011 U	0.01 U

Notes:
N = native sample
FD = field duplicate sample
J = Estimated.
U = Nondetect or not detected at significantly greater than that in an associated blank.

UJ = Nondetect. Estimated reporting limit.
mg/kg = milligrams per kilogram
Bold indicates the analyte was detected

Appendix D - Table 1
Submerged Sediment Sample Results
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Location	SD04		SD05	SD06	SD07	SD08	SD09
Sample ID	TMC-SD04-0001	TMC-SDP04-0001	TMC-SD05-0001	TMC-SD06-0001	TMC-SDP07-0001	TMC-SD08-0001	TMC-SD09-0001
Sample Date	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012	05/01/2012
Sample Depth (ft)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Sample Type	N	FD	N	N	FD	N	N
Analyte (mg/kg)							
PCB-1016	0.01 U	0.01 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U
PCB-1221	0.016 U	0.017 U	0.019 U	0.017 U	0.019 U	0.017 U	0.018 U
PCB-1232	0.01 U	0.01 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U
PCB-1242	0.01 U	0.01 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U
PCB-1248	0.01 U	0.01 U	0.011 U	0.011 U	**0.24**	**0.061**	**0.1**
PCB-1254	**0.01 J**	**0.011 J**	0.011 U	**0.014 J**	**0.16 J**	**0.054**	**0.089**
PCB-1260	0.01 U	0.01 U	0.011 U	0.011 U	0.012 U	0.011 U	0.011 U

Notes:
N = native sample
FD = field duplicate sample
J = Estimated.
U = Nondetect or not detected at significantly greater than that in an associated blank.

UJ = Nondetect. Estimated reporting limit.
mg/kg = milligrams per kilogram
Bold indicates the analyte was detected

Appendix D - Table 1
Submerged Sediment Sample Results
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Location	SD10	SD11	SD12	SD13	SD14
Sample ID	TMC-SD10-0001	TMC-SD11-0001	TMC-SD12-0001	TMC-SD13-0001	TMC-SD14-0001
Sample Date	05/01/2012	05/02/2012	05/02/2012	05/02/2012	05/02/2012
Sample Depth (ft)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Sample Type	N	N	N	N	N
Analyte (mg/kg)					
PCB-1016	0.0098 UJ	0.011 U	0.01 U	0.01 U	0.0097 U
PCB-1221	0.016 UJ	0.018 U	0.017 U	0.016 U	0.016 U
PCB-1232	0.0098 UJ	0.011 U	0.01 U	0.01 U	0.0097 U
PCB-1242	0.0098 UJ	0.011 U	0.01 U	0.01 U	0.0097 U
PCB-1248	0.0098 UJ	0.011 U	0.01 U	**0.029 J**	0.0097 U
PCB-1254	0.0098 UJ	0.011 U	**0.0065 J**	**0.037 J**	**0.0082 J**
PCB-1260	0.0098 UJ	0.011 U	0.01 U	0.01 U	0.0097 U

Notes:
N = native sample
FD = field duplicate sample
J = Estimated.
U = Nondetect or not detected at significantly greater than that in an associated blank.

UJ = Nondetect. Estimated reporting limit.
mg/kg = milligrams per kilogram
Bold indicates the analyte was detected

Appendix D - Table 2

Incremental Sample Results

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Location	**DU01**		**DU02**	**DU03**		**DU04**
Sample ID	TMC-DU01 DUP	TMC-DU01	TMC-DU02	TMC-DU03	TMC-DU04	TMC-DU04-T
Sample Date	04/26/2012	04/26/2012	04/26/2012	04/27/2012	04/27/2012	04/27/2012
Sample Depth (ft)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Sample Type	FD	N	N	N	N	FD
Analyte (mg/kg)						
PCB-1016	0.0082 UJ	0.0081 UJ	0.0081 UJ	0.0083 UJ	0.0081 UJ	0.0082 UJ
PCB-1221	0.013 UJ	0.013 UJ	0.013 UJ	0.013 UJ	0.013 UJ	0.013 UJ
PCB-1232	0.0082 UJ	0.0081 UJ	0.0081 UJ	0.0083 UJ	0.0081 UJ	0.0082 UJ
PCB-1242	0.0082 UJ	0.0081 UJ	0.0081 UJ	0.0083 UJ	0.0081 UJ	0.0082 UJ
PCB-1248	**0.14 J**	**0.13 J**	**0.023 J**	**0.048 J**	**0.037 J**	**0.052 J**
PCB-1254	**0.14 J**	**0.13 J**	**0.026 J**	**0.04 J**	**0.033 J**	**0.041 J**
PCB-1260	0.0082 UJ	0.0081 UJ	0.0081 UJ	0.0083 UJ	0.0081 UJ	0.0082 UJ

Notes:

N = native sample

FD = field duplicate sample

J = Estimated.

UJ = Nondetect. Estimated reporting limit.

mg/kg = milligrams per kilogram

Bold indicates the analyte was detected

Appendix D - Table 2

Incremental Sample Results

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Location		**DU05**	**DU06**
Sample ID	TMC-DU04-TT	TMC-DU05	TMC-DU06-050112
Sample Date	04/27/2012	04/27/2012	05/01/2012
Sample Depth (ft)	0 - 0.5	0 - 0.5	0 - 0.5
Sample Type	FD	N	N
Analyte (mg/kg)			
PCB-1016	0.008 UJ	0.0081 UJ	0.0081 UJ
PCB-1221	0.013 UJ	0.013 UJ	0.013 UJ
PCB-1232	0.008 UJ	0.0081 UJ	0.0081 UJ
PCB-1242	0.008 UJ	0.0081 UJ	0.0081 UJ
PCB-1248	**0.026 J**	**0.054 J**	**0.071 J**
PCB-1254	**0.027 J**	**0.046 J**	**0.05 J**
PCB-1260	0.008 UJ	0.0081 UJ	0.0081 UJ

Notes:

N = native sample

FD = field duplicate sample

J = Estimated.

UJ = Nondetect. Estimated reporting limit.

mg/kg = milligrams per kilogram

Bold indicates the analyte was detected

Appendix D - Table 3
Soil Profile Sample Results
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)						
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1016**	**PCB-1221**	**PCB-1232**	**PCB-1242**	**PCB-1248**	**PCB-1254**	**PCB-1260**
SB01	TMC-SB01-0002	0 - 2	04/17/2012	N	0.0089 U	0.015 U	0.0089 U	0.0089 U	0.0089 U	**0.25**	0.0089 U
	TMC-SB01P-0002	0 - 2	04/17/2012	FD	0.023 U	0.037 U	0.023 U	0.023 U	0.023 U	**0.35**	0.023 U
	TMC-SB01-0204	2 - 4	04/17/2012	N	0.046 U	0.076 U	0.046 U	0.046 U	0.046 U	**0.55**	0.046 U
	TMC-SB01-0406	4 - 6	04/17/2012	N	0.053 U	0.086 U	0.053 U	0.053 U	0.053 U	**0.54**	0.053 U
	TMC-SB01-0608	6 - 8	04/17/2012	N	0.061 U	0.099 U	0.061 U	0.061 U	0.061 U	**0.65**	0.061 U
	TMC-SB01-0810	8 - 10	04/17/2012	N	0.057 U	0.092 U	0.057 U	0.057 U	0.057 U	**0.68**	0.057 U
	TMC-SB01-1012	10 - 12	04/17/2012	N	0.1 U	0.17 U	0.1 U	0.1 U	**1 J**	**0.63 J**	0.1 U
	TMC-SB01-1214	12 - 14	04/17/2012	N	0.0086 U	0.014 U	0.0086 U	0.0086 U	0.0086 U	**0.021 J**	0.0086 U
	TMC-SB01-1416	14 - 16	04/17/2012	N	0.0092 U	0.015 U	0.0092 U	0.0092 U	**0.34**	**0.28**	0.0092 U
	TMC-SB01-1618	16 - 18	04/17/2012	N	0.1 U	0.16 U	0.1 U	0.1 U	**0.96 J**	**0.61 J**	0.1 U
	TMC-SB01-1717.5-D	17 - 17.5	04/17/2012	N	0.27 U	0.44 U	0.27 U	0.27 U	**4.4**	**2.8**	0.27 U
	TMC-SB01-1820	18 - 20	04/17/2012	N	0.011 U	0.018 U	0.011 U	0.011 U	**0.13**	**0.076**	0.011 U
	TMC-SB01-2022	20 - 22	04/17/2012	N	0.094 U	0.15 U	0.094 U	0.094 U	**0.52 J**	**0.31 J**	0.094 U
	TMC-SB01-2224	22 - 24	04/17/2012	N	0.23 U	0.38 U	0.23 U	0.23 U	**1.8**	**1.2**	0.23 U
SB02	TMC-SB02-0002	0 - 2	04/17/2012	N	0.097 U	0.16 U	0.097 U	0.097 U	**0.5**	**0.61**	0.097 U
	TMC-SB02-0204	2 - 4	04/17/2012	N	0.1 U	0.16 U	0.1 U	0.1 U	**0.7**	**0.64**	0.1 U
	TMC-SB02-0406	4 - 6	04/17/2012	N	0.0083 U	0.014 U	0.0083 U	0.0083 U	**0.034**	**0.018 J**	0.0083 U
	TMC-SB02-0608	6 - 8	04/17/2012	N	0.0092 U	0.015 U	0.0092 U	0.0092 U	**0.21**	**0.12**	0.0092 U
	TMC-SB02-0810	8 - 10	04/17/2012	N	0.098 U	0.16 U	0.098 U	0.098 U	**0.9**	**0.5**	0.098 U
	TMC-SB02-1012	10 - 12	04/17/2012	N	0.27 U	0.44 U	0.27 U	0.27 U	0.27 U	**5.1**	0.27 U
	TMC-SB02-1214	12 - 14	04/17/2012	N	0.12 U	0.19 U	0.12 U	0.12 U	**2.4**	**1.6**	0.12 U
	TMC-SB02-12.513-D	12.5 - 13	04/17/2012	N	0.13 U	0.21 U	0.13 U	0.13 U	**3.1**	**2**	0.13 U
	TMC-SB02-1416	14 - 16	04/17/2012	N	0.14 U	0.22 U	0.14 U	0.14 U	**3.6**	**2.2**	0.14 U
	TMC-SB02-1618	16 - 18	04/17/2012	N	0.13 U	0.21 U	0.13 U	0.13 U	0.13 U	**2.3 J**	0.13 U
SB03	TMC-SB03-0002	0 - 2	04/17/2012	N	0.048 U	0.078 U	0.048 U	0.048 U	0.048 U	**0.61**	0.048 U
	TMC-SB03-0204	2 - 4	04/17/2012	N	0.052 U	0.085 U	0.052 U	0.052 U	0.052 U	**0.92**	0.052 U
	TMC-SB03-0406	4 - 6	04/17/2012	N	0.049 U	0.08 U	0.049 U	0.049 U	**1.2**	**0.89**	0.049 U
	TMC-SB03-0608	6 - 8	04/17/2012	N	0.0092 U	0.015 U	0.0092 U	0.0092 U	**0.18**	**0.11**	0.0092 U
	TMC-SB03-0810	8 - 10	04/17/2012	N	0.22 U	0.36 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
	TMC-SB03-0995-D	9 - 9.5	04/17/2012	N	0.7 U	1.1 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
	TMC-SB03-1012	10 - 12	04/17/2012	N	0.018 U	0.029 U	0.018 U	0.018 U	0.018 U	0.018 U	0.018 U
	TMC-SB03-1214	12 - 14	04/17/2012	N	0.25 U	0.4 U	0.25 U	0.25 U	0.25 U	**2.9**	0.25 U
	TMC-SB03-1416	14 - 16	04/17/2012	N	0.11 U	0.17 U	0.11 U	0.11 U	0.11 U	**0.64 J**	0.11 U
SB04	TMC-SB04-0002	0 - 2	04/24/2012	N	0.05 U	0.081 U	0.05 U	0.05 U	0.05 U	**0.62**	0.05 U
	TMC-SB04P-0002	0 - 2	04/24/2012	FD	0.019 U	0.031 U	0.019 U	0.019 U	**0.38**	**0.56**	0.019 U
	TMC-SB04-0204	2 - 4	04/24/2012	N	0.048 U	0.079 U	0.048 U	0.048 U	**0.5**	**0.6**	0.048 U
	TMC-SB04-0406	4 - 6	04/24/2012	N	0.12 U	0.2 U	0.12 U	0.12 U	**3.4 J**	**2.6 J**	0.12 U
	TMC-SB04-0608	6 - 8	04/24/2012	N	0.12 U	0.19 U	0.12 U	0.12 U	**2 J**	**1.6 J**	0.12 U
	TMC-SB04-0810	8 - 10	04/24/2012	N	0.052 U	0.084 U	0.052 U	0.052 U	**0.82**	**0.53**	0.052 U
	TMC-SB04-1012	10 - 12	04/24/2012	N	0.0084 U	0.014 U	0.0084 U	0.0084 U	**0.22**	**0.13**	0.0084 U
	TMC-SB04-1212.4-D	12 - 12.4	04/24/2012	N	0.011 UJ	0.017 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ	0.011 UJ
	TMC-SB04-1214	12 - 14	04/24/2012	N	0.0098 U	0.016 U	0.0098 U	0.0098 U	**0.12**	**0.057**	0.0098 U

Appendix D - Table 3
Soil Profile Sample Results
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)						
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1016**	**PCB-1221**	**PCB-1232**	**PCB-1242**	**PCB-1248**	**PCB-1254**	**PCB-1260**
	TMC-SB04-1416	14 - 16	04/24/2012	N	0.0095 U	0.015 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U
	TMC-SB04-1618	16 - 18	04/24/2012	N	0.0094 U	0.015 U	0.0094 U	0.0094 U	0.0094 U	**0.019 J**	0.0094 U
	TMC-SB04-1819	18 - 19	04/24/2012	N	0.084 U	0.14 U	0.084 U	0.084 U	0.084 U	**0.31 J**	0.084 U
	TMC-SB04-2224	22 - 24	04/24/2012	N	0.011 U	0.017 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
SB05	TMC-SB05-0002	0 - 2	04/19/2012	N	0.0093 U	0.015 U	0.0093 U	0.0093 U	0.0093 U	**0.17**	0.0093 U
	TMC-SB05P-0002	0 - 2	04/19/2012	FD	0.0092 U	0.015 U	0.0092 U	0.0092 U	0.0092 U	**0.21**	0.0092 U
	TMC-SB05-0204	2 - 4	04/19/2012	N	0.01 U	0.016 U	0.01 U	0.01 U	0.01 U	**0.36**	0.01 U
	TMC-SB05-0406	4 - 6	04/19/2012	N	0.023 U	0.037 U	0.023 U	0.023 U	0.023 U	**0.57**	0.023 U
	TMC-SB05-0608	6 - 8	04/19/2012	N	0.05 U	0.082 U	0.05 U	0.05 U	**0.88 J**	**0.61 J**	0.05 U
	TMC-SB05-0810	8 - 10	04/19/2012	N	0.049 U	0.079 U	0.049 U	0.049 U	**0.8 J**	**0.45 J**	0.049 U
	TMC-SB05-09.510-D	9.5 - 10	04/19/2012	N	0.026 UJ	0.042 UJ	0.026 UJ	0.026 UJ	**0.72 J**	**0.44 J**	0.026 UJ
	TMC-SB05-1012	10 - 12	04/19/2012	N	0.054 U	0.088 U	0.054 U	0.054 U	**0.87 J**	**0.53 J**	0.054 U
SB06	TMC-SB06-0002	0 - 2	04/24/2012	N	0.0099 U	0.016 U	0.0099 U	0.0099 U	0.0099 U	**0.35**	0.0099 U
	TMC-SB06P-0002	0 - 2	04/24/2012	FD	0.0096 U	0.016 U	0.0096 U	0.0096 U	0.0096 U	**0.3**	0.0096 U
	TMC-SB06-0204	2 - 4	04/24/2012	N	0.049 U	0.079 U	0.049 U	0.049 U	0.049 U	**0.75**	0.049 U
	TMC-SB06-0406	4 - 6	04/24/2012	N	0.095 U	0.15 U	0.095 U	0.095 U	0.095 U	**1.5 J**	0.095 U
	TMC-SB06-0607	6 - 7	04/24/2012	N	0.2 U	0.33 U	0.2 U	0.2 U	**2.4**	**2.1**	0.2 U
	TMC-SB06-0810	8 - 10	04/24/2012	N	0.0088 U	0.014 U	0.0088 U	0.0088 U	**0.084**	**0.08**	0.0088 U
	TMC-SB06-1012	10 - 12	04/24/2012	N	0.12 U	0.19 U	0.12 U	0.12 U	**1.9 J**	**1.1 J**	0.12 U
	TMC-SB06-1111.5-D	11 - 11.5	04/24/2012	N	0.072 UJ	0.12 UJ	0.072 UJ	0.072 UJ	**2.3 J**	**1.1 J**	0.072 UJ
SB07	TMC-SB07-0002	0 - 2	04/19/2012	N	0.93 U	1.5 U	0.93 U	0.93 U	**4.3**	**6.2**	0.93 U
	TMC-SB07P-0002	0 - 2	04/19/2012	FD	0.96 U	1.6 U	0.96 U	0.96 U	**4.7**	**6.7**	0.96 U
	TMC-SB07-0204	2 - 4	04/19/2012	N	0.2 U	0.32 U	0.2 U	0.2 U	**2.3**	**4.1**	0.2 U
	TMC-SB07-0406	4 - 6	04/19/2012	N	0.047 U	0.077 U	0.047 U	0.047 U	**0.81**	**1.4**	0.047 U
	TMC-SB07-0608	6 - 8	04/19/2012	N	0.0093 U	0.015 U	0.0093 U	0.0093 U	0.0093 U	**0.19**	0.0093 U
	TMC-SB07-0810	8 - 10	04/19/2012	N	0.12 U	0.19 U	0.12 U	0.12 U	**1.8 J**	**1.2 J**	0.12 U
	TMC-SB07-09.510-D	9.5 - 10	04/19/2012	N	0.069 U	0.11 U	0.069 U	0.069 U	**1.8 J**	**1.1 J**	0.069 U
	TMC-SB07-1011	10 - 11	04/19/2012	N	0.023 U	0.038 U	0.023 U	0.023 U	**0.64**	**0.36**	0.023 U
SB08	TMC-SB08-0002	0 - 2	04/20/2012	N	0.0092 U	0.015 U	0.0092 U	0.0092 U	0.0092 U	**0.22**	0.0092 U
	TMC-SB08-0204	2 - 4	04/20/2012	N	0.048 U	0.078 U	0.048 U	0.048 U	0.048 U	**1.3**	0.048 U
	TMC-SB08-0406	4 - 6	04/20/2012	N	0.0094 U	0.015 U	0.0094 U	0.0094 U	0.0094 U	**0.18**	0.0094 U
	TMC-SB08-0608	6 - 8	04/20/2012	N	0.019 U	0.032 U	0.019 U	0.019 U	0.019 U	**0.43**	0.019 U
	TMC-SB08-0810	8 - 10	04/20/2012	N	0.019 U	0.032 U	0.019 U	0.019 U	0.019 U	**0.56**	0.019 U
	TMC-SB08-1012	10 - 12	04/20/2012	N	0.02 U	0.032 U	0.02 U	0.02 U	**0.35**	**0.25**	0.02 U
	TMC-SB08-1111.5-D	11 - 11.5	04/20/2012	N	0.0097 U	0.016 U	0.0097 U	0.0097 U	**0.18**	**0.14**	0.0097 U
	TMC-SB08-1214	12 - 14	04/20/2012	N	0.0096 U	0.016 U	0.0096 U	0.0096 U	**0.13**	**0.14**	0.0096 U
	TMC-SB08-1415	14 - 15	04/20/2012	N	0.011 U	0.017 U	0.011 U	0.011 U	**0.3**	**0.25**	0.011 U
SB09	TMC-SB09-0002	0 - 2	04/19/2012	N	0.047 U	0.077 U	0.047 U	0.047 U	**0.76**	**0.77**	0.047 U
	TMC-SB09D-0002	0 - 2	04/19/2012	FD	0.05 U	0.081 U	0.05 U	0.05 U	**1.2**	**1.2**	0.05 U
	TMC-SB09-0204	2 - 4	04/19/2012	N	0.09 U	0.15 U	0.09 U	0.09 U	**3.3**	**2**	0.09 U
	TMC-SB09-0406	4 - 6	04/19/2012	N	0.0097 UJ	0.016 UJ	0.0097 UJ	0.0097 UJ	**0.11 J**	**0.092 J**	0.0097 UJ
	TMC-SB09-0608	6 - 8	04/19/2012	N	0.046 U	0.074 U	0.046 U	0.046 U	**1.1 J**	**0.73 J**	0.046 U

Appendix D - Table 3
Soil Profile Sample Results
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)						
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1016**	**PCB-1221**	**PCB-1232**	**PCB-1242**	**PCB-1248**	**PCB-1254**	**PCB-1260**
	TMC-SB09-0810	8 - 10	04/19/2012	N	0.0096 U	0.016 U	0.0096 U	0.0096 U	**0.25**	**0.17**	0.0096 U
	TMC-SB09-1010.5-D	10 - 10.5	04/19/2012	N	0.05 U	0.081 U	0.05 U	0.05 U	**1.3 J**	**0.69 J**	0.05 U
	TMC-SB09-1012	10 - 12	04/19/2012	N	0.02 U	0.033 U	0.02 U	0.02 U	**0.54 J**	**0.3 J**	0.02 U
	TMC-SB10-0002	0 - 2	04/20/2012	N	0.018 U	0.029 U	0.018 U	0.018 U	0.018 U	**0.38**	0.018 U
	TMC-SB10-0204	2 - 4	04/20/2012	N	0.0089 U	0.014 U	0.0089 U	0.0089 U	0.0089 U	**0.29**	0.0089 U
	TMC-SB10-0406	4 - 6	04/20/2012	N	0.051 U	0.083 U	0.051 U	0.051 U	0.051 U	**0.83**	0.051 U
SB10	TMC-SB10-0608	6 - 8	04/20/2012	N	0.047 U	0.077 U	0.047 U	0.047 U	0.047 U	**0.48**	0.047 U
	TMC-SB10-0810	8 - 10	04/20/2012	N	0.0091 U	0.015 U	0.0091 U	0.0091 U	**0.31 J**	**0.24 J**	0.0091 U
	TMC-SB10-1010.5-D	10 - 10.5	04/20/2012	N	0.12 U	0.2 U	0.12 U	0.12 U	**2.3 J**	**1.5 J**	0.12 U
	TMC-SB10-1012	10 - 12	04/20/2012	N	0.12 U	0.19 U	0.12 U	0.12 U	**2.1 J**	**1.2 J**	0.12 U
	TMC-SB13-0002	0 - 2	04/19/2012	N	0.01 U	0.016 U	0.01 U	0.01 U	0.01 U	**0.27 J**	0.01 U
	TMC-SB13P-0002	0 - 2	04/19/2012	FD	0.049 U	0.08 U	0.049 U	0.049 U	**1.5**	**1.9 J**	0.049 U
	TMC-SB13-0204	2 - 4	04/19/2012	N	0.2 U	0.32 U	0.2 U	0.2 U	**3.3**	**3.3**	0.2 U
	TMC-SB13-0406	4 - 6	04/19/2012	N	0.1 U	0.17 U	0.1 U	0.1 U	**2.4 J**	**2.4 J**	0.1 U
	TMC-SB13-0608	6 - 8	04/19/2012	N	0.012 U	0.019 U	0.012 U	0.012 U	**0.4**	**0.33**	0.012 U
SB13	TMC-SB13-0810	8 - 10	04/19/2012	N	0.012 UJ	0.019 UJ	0.012 UJ	0.012 UJ	**0.47 J**	**0.35 J**	0.012 UJ
	TMC-SB13-1012	10 - 12	04/19/2012	N	0.01 U	0.016 U	0.01 U	0.01 U	**0.11**	**0.1**	0.01 U
	TMC-SB13-1212.5-D	12 - 12.5	04/19/2012	N	0.011 U	0.017 U	0.011 U	0.011 U	**0.078**	**0.062**	0.011 U
	TMC-SB13-1416	14 - 16	04/19/2012	N	0.14 U	0.23 U	0.14 U	0.14 U	**2.4 J**	**1.4 J**	0.14 U
	TMC-SB13-1618	16 - 18	04/19/2012	N	0.0085 U	0.014 U	0.0085 U	0.0085 U	0.0085 U	**0.0086 J**	0.0085 U
	TMC-SB13-1820	18 - 20	04/19/2012	N	0.0089 U	0.014 U	0.0089 U	0.0089 U	**0.25**	**0.13**	0.0089 U
	TMC-SB13-19.520-D	19.5 - 20	04/19/2012	N	0.028 U	0.046 U	0.028 U	0.028 U	**0.54**	**0.31**	0.028 U
	TMC-SB14-0002	0 - 2	04/25/2012	N	0.02 U	0.032 U	0.02 U	0.02 U	0.02 U	**0.48**	0.02 U
	TMC-SB14P-0002	0 - 2	04/25/2012	FD	0.02 U	0.033 U	0.02 U	0.02 U	0.02 U	**0.47**	0.02 U
	TMC-SB14-0204	2 - 4	04/25/2012	N	0.17 U	0.28 U	0.17 U	0.17 U	**2**	**2.4**	0.17 U
	TMC-SB14-0406	4 - 6	04/25/2012	N	0.0084 UJ	0.014 UJ	0.0084 UJ	0.0084 UJ	**0.025 J**	**0.045 J**	0.0084 UJ
	TMC-SB14-0608	6 - 8	04/25/2012	N	0.0084 U	0.014 U	0.0084 U	0.0084 U	**0.014 J**	**0.028 J**	0.0084 U
	TMC-SB14-0810	8 - 10	04/25/2012	N	0.0086 UJ	0.014 UJ	0.0086 UJ	0.0086 UJ	**0.017 J**	**0.034 J**	0.0086 UJ
	TMC-SB14-1012	10 - 12	04/25/2012	N	0.0085 UJ	0.014 UJ	0.0085 UJ	0.0085 UJ	**0.021 J**	**0.045 J**	0.0085 UJ
	TMC-SB14-1214	12 - 14	04/25/2012	N	0.0085 UJ	0.014 UJ	0.0085 UJ	0.0085 UJ	**0.022 J**	**0.038 J**	0.0085 UJ
	TMC-SB14-1416	14 - 16	04/25/2012	N	0.0082 UJ	0.013 UJ	0.0082 UJ	0.0082 UJ	**0.045 J**	**0.05 J**	0.0082 UJ
SB14	TMC-SB14-1618	16 - 18	04/25/2012	N	0.043 U	0.069 U	0.043 U	0.043 U	**0.58**	**0.4**	0.043 U
	TMC-SB14-1820	18 - 20	04/25/2012	N	0.048 U	0.077 U	0.048 U	0.048 U	**0.65**	**0.49**	0.048 U
	TMC-SB14-2020.5-D	20 - 20.5	04/25/2012	N	0.12 U	0.19 U	0.12 U	0.12 U	**1.9 J**	**1.7 J**	0.12 U
	TMC-SB14-2022	20 - 22	04/25/2012	N	0.052 U	0.085 U	0.052 U	0.052 U	**0.89**	**0.91**	0.052 U
	TMC-SB14P-2022	20 - 22	04/25/2012	FD	0.053 U	0.087 U	0.053 U	0.053 U	**0.83**	**0.87**	0.053 U
	TMC-SB14-2224	22 - 24	04/25/2012	N	0.0094 U	0.015 U	0.0094 U	0.0094 U	**0.19**	**0.24**	0.0094 U
	TMC-SB14-2426	24 - 26	04/25/2012	N	0.0091 U	0.015 U	0.0091 U	0.0091 U	**0.11**	**0.17**	0.0091 U
	TMC-SB14-2628	26 - 28	04/25/2012	N	0.048 U	0.078 U	0.048 U	0.048 U	**0.78 J**	**0.68 J**	0.048 U
	TMC-SB14-2830	28 - 30	04/25/2012	N	0.22 U	0.36 U	0.22 U	0.22 U	**3.8**	**2.8**	0.22 U
	TMC-SB14-3031	30 - 31	04/25/2012	N	0.012 U	0.019 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
	TMC-SB15-0002	0 - 2	04/19/2012	N	0.009 U	0.015 U	0.009 U	0.009 U	0.009 U	**0.19**	0.009 U

Appendix D - Table 3
Soil Profile Sample Results
Supplemental Remedial Investigation
Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)						
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1016**	**PCB-1221**	**PCB-1232**	**PCB-1242**	**PCB-1248**	**PCB-1254**	**PCB-1260**
SB15	TMC-SB15P-0002	0 - 2	04/19/2012	FD	0.009 U	0.015 U	0.009 U	0.009 U	**0.13**	**0.15**	0.009 U
	TMC-SB15-0204	2 - 4	04/19/2012	N	0.0083 U	0.013 U	0.0083 U	0.0083 U	0.0083 U	**0.024 J**	0.0083 U
	TMC-SB15-0406	4 - 6	04/19/2012	N	0.0086 U	0.014 U	0.0086 U	0.0086 U	0.0086 U	**0.023 J**	0.0086 U
	TMC-SB15-0608	6 - 8	04/19/2012	N	0.0084 U	0.014 U	0.0084 U	0.0084 U	0.0084 U	**0.023 J**	0.0084 U
	TMC-SB15-0810	8 - 10	04/19/2012	N	0.067 U	0.11 U	0.067 U	0.067 U	**1.2**	**0.85**	0.067 U
	TMC-SB15-1012	10 - 12	04/19/2012	N	2.6 U	4.3 U	2.6 U	2.6 U	2.6 U	2.6 U	**52**
	TMC-SB15-1214	12 - 14	04/19/2012	N	0.095 U	0.15 U	0.095 U	0.095 U	0.095 U	**1.8 J**	**0.49 J**
	TMC-SB15-1414.5D	14 - 14.5	04/19/2012	N	0.057 U	0.093 U	0.057 U	0.057 U	**1.2 J**	**1.1 J**	0.057 U
	TMC-SB15-1416	14 - 16	04/19/2012	N	0.047 U	0.077 U	0.047 U	0.047 U	**1.5 J**	**0.81 J**	0.047 U
	TMC-SB15-1618	16 - 18	04/19/2012	N	0.0092 U	0.015 U	0.0092 U	0.0092 U	**0.26**	**0.17**	0.0092 U
	TMC-SB15-1820	18 - 20	04/19/2012	N	0.0086 U	0.014 U	0.0086 U	0.0086 U	**0.13**	**0.099**	0.0086 U
	TMC-SB15-2022	20 - 22	04/19/2012	N	0.0086 U	0.014 U	0.0086 U	0.0086 U	**0.076**	**0.048**	0.0086 U
	TMC-SB15-2224	22 - 24	04/19/2012	N	0.0099 U	0.016 U	0.0099 U	0.0099 U	**0.42**	**0.3**	0.0099 U
SB16	TMC-SB16-0002	0 - 2	04/24/2012	N	0.019 U	0.031 U	0.019 U	0.019 U	**0.3**	**0.43**	0.019 U
	TMC-SB16P-0002	0 - 2	04/24/2012	FD	0.049 U	0.079 U	0.049 U	0.049 U	**0.46**	**0.62**	0.049 U
	TMC-SB16-0204	2 - 4	04/24/2012	N	0.018 U	0.029 U	0.018 U	0.018 U	0.018 U	**0.33**	0.018 U
	TMC-SB16-0406	4 - 6	04/24/2012	N	0.22 U	0.36 U	0.22 U	0.22 U	0.22 U	**8.6**	0.22 U
	TMC-SB16-0608	6 - 8	04/24/2012	N	0.0084 U	0.014 U	0.0084 U	0.0084 U	0.0084 U	**0.02 J**	0.0084 U
	TMC-SB16-0810	8 - 10	04/24/2012	N	0.0087 U	0.014 U	0.0087 U	0.0087 U	0.0087 U	**0.093**	0.0087 U
	TMC-SB16-1012	10 - 12	04/24/2012	N	0.093 U	0.15 U	0.093 U	0.093 U	**3 J**	**2 J**	**0.82 J**
	TMC-SB16-1214	12 - 14	04/24/2012	N	0.099 U	0.16 U	0.099 U	0.099 U	**3.2 J**	**1.6 J**	**0.38 J**
	TMC-SB16-1416	14 - 16	04/24/2012	N	0.1 U	0.17 U	0.1 U	0.1 U	0.1 U	**1.2 J**	**0.52 J**
	TMC-SB16-14.515-D	14.5 - 15	04/24/2012	N	0.28 U	0.46 U	0.28 U	0.28 U	**9.6**	**5.1**	0.28 U
	TMC-SB16-1618	16 - 18	04/24/2012	N	0.0089 UJ	0.014 UJ	0.0089 UJ	0.0089 UJ	0.0089 UJ	0.0089 UJ	0.0089 UJ
	TMC-SB16-1820	18 - 20	04/24/2012	N	0.0094 U	0.015 U	0.0094 U	0.0094 U	**0.25**	**0.16**	0.0094 U
	TMC-SB16-2021	20 - 21	04/24/2012	N	0.0097 U	0.016 U	0.0097 U	0.0097 U	**0.023 J**	**0.015 J**	0.0097 U
SB17	TMC-SB17-0002	0 - 2	04/25/2012	N	0.094 U	0.15 U	0.094 U	0.094 U	**1.3**	**1.4**	0.094 U
	TMC-SB17P-0002	0 - 2	04/25/2012	FD	0.19 U	0.31 U	0.19 U	0.19 U	**1.6**	**1.9**	0.19 U
	TMC-SB17-0204	2 - 4	04/25/2012	N	0.18 U	0.29 U	0.18 U	0.18 U	**5.1**	**5.8**	0.18 U
	TMC-SB17-0406	4 - 6	04/25/2012	N	1 U	1.7 U	1 U	1 U	**16**	**14**	1 U
	TMC-SB17-0608	6 - 8	04/25/2012	N	0.09 U	0.15 U	0.09 U	0.09 U	**2.8**	**2.9**	0.09 U
	TMC-SB17-0810	8 - 10	04/25/2012	N	0.089 U	0.15 U	0.089 U	0.089 U	**1.7**	**1.9**	0.089 U
	TMC-SB17-1012	10 - 12	04/25/2012	N	0.093 U	0.15 U	0.093 U	0.093 U	**1.7**	**1.8**	0.093 U
	TMC-SB17-1214	12 - 14	04/25/2012	N	0.096 U	0.16 U	0.096 U	0.096 U	**3.6 J**	**3.1 J**	0.096 U
	TMC-SB17-1416	14 - 16	04/25/2012	N	0.091 U	0.15 U	0.091 U	0.091 U	**0.9**	**0.9**	0.091 U
	TMC-SB17-1618	16 - 18	04/25/2012	N	0.02 U	0.032 U	0.02 U	0.02 U	**0.36**	**0.39**	0.02 U
	TMC-SB17-1717.5-D	17 - 17.5	04/25/2012	N	0.022 U	0.035 U	0.022 U	0.022 U	**0.27**	**0.45**	0.022 U
	TMC-SB17-1820	18 - 20	04/25/2012	N	0.2 U	0.33 U	0.2 U	0.2 U	0.2 U	**1.2**	0.2 U
	TMC-SB18-0002	0 - 2	04/25/2012	N	0.0089 U	0.014 U	0.0089 U	0.0089 U	0.0089 U	**0.15**	0.0089 U
	TMC-SB18P-0002	0 - 2	04/25/2012	FD	0.0089 U	0.014 U	0.0089 U	0.0089 U	0.0089 U	**0.14**	0.0089 U
	TMC-SB18-0204	2 - 4	04/25/2012	N	0.02 U	0.033 U	0.02 U	0.02 U	**0.32**	**0.46**	0.02 U
	TMC-SB18-0406	4 - 6	04/25/2012	N	0.0096 U	0.016 U	0.0096 U	0.0096 U	0.0096 U	**0.32**	0.0096 U

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Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

					Analyte (mg/kg)						
Location	**Sample ID**	**Sample Depth (ft)**	**Sample Date**	**SampleType**	**PCB-1016**	**PCB-1221**	**PCB-1232**	**PCB-1242**	**PCB-1248**	**PCB-1254**	**PCB-1260**
	TMC-SB18-0608	6 - 8	04/25/2012	N	0.011 U	0.017 U	0.011 U	0.011 U	**0.17**	**0.17**	0.011 U
	TMC-SB18-0810	8 - 10	04/25/2012	N	0.011 U	0.018 U	0.011 U	0.011 U	**0.4**	**0.34**	0.011 U
SB18	TMC-SB18-1012	10 - 12	04/25/2012	N	0.0097 U	0.016 U	0.0097 U	0.0097 U	**0.13**	**0.095**	0.0097 U
	TMC-SB18-1214	12 - 14	04/25/2012	N	0.19 U	0.31 U	0.19 U	0.19 U	0.19 U	**2.9**	0.19 U
	TMC-SB18-1313.5-D	13 - 13.5	04/25/2012	N	0.058 U	0.094 U	0.058 U	0.058 U	**1.6 J**	**1.8 J**	0.058 U
	TMC-SB18-1416	14 - 16	04/25/2012	N	0.021 U	0.034 U	0.021 U	0.021 U	**0.5**	**0.47**	0.021 U
	TMC-SB18-1618	16 - 18	04/25/2012	N	0.0098 U	0.016 U	0.0098 U	0.0098 U	**0.3**	**0.24**	0.0098 U
	TMC-SB18P-1618	16 - 18	04/25/2012	FD	0.01 U	0.016 U	0.01 U	0.01 U	**0.33**	**0.23**	0.01 U
	TMC-SB18-1819	18 - 19	04/25/2012	N	0.01 U	0.017 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
	TMC-SB19-0002	0 - 2	04/25/2012	N	0.009 U	0.015 U	0.009 U	0.009 U	0.009 U	**0.22**	0.009 U
	TMC-SB19P-0002	0 - 2	04/25/2012	FD	0.0099 U	0.016 U	0.0099 U	0.0099 U	0.0099 U	**0.2**	0.0099 U
	TMC-SB19-011.5-D	1 - 1.5	04/25/2012	N	0.018 U	0.029 U	0.018 U	0.018 U	**0.27 J**	**0.4**	0.018 U
	TMC-SB19-0204	2 - 4	04/25/2012	N	0.0097 U	0.016 U	0.0097 U	0.0097 U	**0.1**	**0.18**	0.0097 U
	TMC-SB19-0406	4 - 6	04/25/2012	N	0.18 U	0.29 U	0.18 U	0.18 U	**3.1**	**3.2**	0.18 U
SB19	TMC-SB19-0608	6 - 8	04/25/2012	N	0.99 U	1.6 U	0.99 U	0.99 U	**13**	**11**	0.99 U
	TMC-SB19-0810	8 - 10	04/25/2012	N	0.96 U	1.6 U	0.96 U	0.96 U	**5.4**	**3.3 J**	0.96 U
	TMC-SB19-1012	10 - 12	04/25/2012	N	0.092 U	0.15 U	0.092 U	0.092 U	**0.66**	**0.81**	0.092 U
	TMC-SB19-1214	12 - 14	04/25/2012	N	0.11 U	0.17 U	0.11 U	0.11 U	**0.72 J**	**0.98 J**	0.11 U
	TMC-SB19-1416	14 - 16	04/25/2012	N	0.022 U	0.036 U	0.022 U	0.022 U	**0.43**	**0.51**	0.022 U
	TMC-SB19-1617	16 - 17	04/25/2012	N	0.011 U	0.017 U	0.011 U	0.011 U	**0.31**	**0.33**	0.011 U
	TMC-SB20-0002	0 - 2	04/25/2012	N	0.0087 U	0.014 U	0.0087 U	0.0087 U	**0.09**	**0.17**	0.0087 U
	TMC-SB20P-0002	0 - 2	04/25/2012	FD	0.0084 U	0.014 U	0.0084 U	0.0084 U	**0.068**	**0.12**	0.0084 U
	TMC-SB20-0204	2 - 4	04/25/2012	N	0.0088 U	0.014 U	0.0088 U	0.0088 U	**0.078**	**0.13**	0.0088 U
SB20	TMC-SB20-0406	4 - 6	04/25/2012	N	0.0089 U	0.015 U	0.0089 U	0.0089 U	**0.15**	**0.19**	0.0089 U
	TMC-SB20-0608	6 - 8	04/25/2012	N	0.01 U	0.017 U	0.01 U	0.01 U	**0.14**	**0.14**	0.01 U
	TMC-SB20-0810	8 - 10	04/25/2012	N	0.0095 U	0.015 U	0.0095 U	0.0095 U	**0.14**	**0.16**	0.0095 U
	TMC-SB20-9.510-D	9.5 - 10	04/25/2012	N	0.021 U	0.034 U	0.021 U	0.021 U	**0.51**	**0.46**	0.021 U

Notes:
N = native sample
FD = field duplicate sample
J = Estimated.
U = Nondetect or not detected at significantly greater than that in an associated blank.
UJ = Nondetect. Estimated reporting limit.
mg/kg = milligrams per kilogram
Bold indicates the analyte was detected
(D) = Discrete sample collected in dark organic layers observed.
Sample location SB 11 could not be sampled due to construction repairs and the presence of erosion control netting. Also, location SB12 could not be sampled due to the absence of soil/sediment at the rock outcrop. The omission of these sample locations was approved in the field by USEPA representatives.

Appendix E
Mass Estimate Calculation Technical Memorandum

Mass Estimate Calculation for Operable Unit 2 of the Sangamo Weston, Inc./Twelvemile Creek/Lake Hartwell Superfund Site, Pickens County, South Carolina

PREPARED FOR: Virgilio Cocianni/Schlumberger Technology Company

PREPARED BY: CH2M HILL

DATE: September 2012

Introduction

Between 1955 and 1977, Sangamo Weston, Inc., used a variety of dielectric fluids in its manufacturing processes, including fluids that contained polychlorinated biphenyls (PCBs). An estimated 3 percent of the quantities received and used at the plant were discharged to Town Creek, resulting in an estimated cumulative discharge of over 400,000 pounds of PCBs over the operating life of the plant (Bechtel 1993).

Between March 2010 and July 2011, sediment in Twelvemile Creek was dredged between Station 0+00 and Station 68+00 within the project reach. The project reach is defined as 1,500 feet upstream of the former Woodside 1 dam to 700 feet downstream of the former Woodside 2 dam. Sampling was completed in April 2012 between Station 0+00 and 53+50 within the project reach to assist in estimating the amount of PCBs remaining after the completion of the dredging event.

Sampling Procedures

Soil samples were collected from 18 locations within the banks of Twelvemile Creek (Figure 1). A total of 186 soil samples were taken from the sidewalls of the creek from station 1+00 to station 53+50 along the north and south sides of the creek and were sampled with either a hand trowel or spade shovel. No samples were collected between Station 53+50 and Station 68+00 due to the presence of little or no sediment within the areas.

Field staff referred to existing station markers (at 100-foot intervals) within the creek for marking and staking sample locations. Each sample location was measured and sketched to illustrate the cross section of the sidewall, and each sediment type was characterized with the visual/manual description method described in ASTM-D4287-11 (American Society for Testing and Materials [ASTM] 2011). Soil samples were collected in 2-foot segments in a stepped method in order to lessen the possibility of cross contamination from sampling segments above and below. More details of the sampling procedures can be found in the forthcoming supplemental remedial investigation report.

Soil Volume Calculations

The cross-sectional area (sample interval height multiplied by the sample interval width) was estimated using field measurements taken at the time of sampling. Each incremental vertical cross-sectional area was multiplied by the stream segment length to determine the volume for the incremental segment. Figure 2 provides an example of how the incremental vertical segments were divided on one side of a bank. Sediment volume dimensions are included in Attachment 1. The following equation was used to obtain the incremental volume:

$$sample\ interval\ depth\ (fixed\ at\ 2\ foot\ intervals) * sample\ interval\ width\ (variable\ width\ in\ feet) * stream\ segment\ length\ (variable\ length\ in\ feet) = soil\ volume\ (feet^3)$$

The segment volumes were summed to obtain the total volume for each of the sidewall sampling locations for a specific length of the project reach and bank. Separate volumes were calculated for the north and south banks of

the creek. Figure 1 shows the stream segment length for each of the sampling locations on the north and side banks of the creek.

Average Soil Density

Cross sections of the sidewall indicate the different soil types for each interval. Table 1 shows the correlation between soil type and bulk density. The average bulk density for the coarser-grained materials is 1.42 grams per cubic centimeter, and the average bulk density for the fine-grained and/or organic layers was 1.13 grams per cubic centimeter.

TABLE 1
Soil Type and Density
Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

Soil Type	Dry Bulk Density (grams per cubic centimeter)	Percent Passing the 200 Sieve
SW and SP	1.55	1.9
	1.29	7
ML, PT, SM, CL, CH	1.13	17
	1.12	43

CL: lean clay
CH: fat clay
ML: silt
PT: peat
SM: silty clay
SP: poorly graded sand
SW: well-graded sand

Multiple soil type information was documented for sampling stations in the vertical profile. The different soil types and the intervals were used to determine an average soil density. For example, the following 3 soil types were detected between the 8- to 10-foot interval in sample TMC-SB09-0810:

- 8 to 8.5 feet: SM-ML
- 8.5 to 9 feet: SW
- 9-10 feet : SM

The average soil density was calculated using the following equation:

$$1.13\frac{g}{cm^3} * \left(\frac{0.5}{2}\right) + \ 1.42\frac{g}{cm^3} * \left(\frac{0.5}{2}\right) + 1.13\frac{g}{cm^3} * \left(\frac{1}{2}\right) = 1.20\frac{g}{cm^3}$$

Mass Calculations

The first step in the mass estimate was to calculate the soil mass for each sampling interval. The soil mass estimate was accomplished using the following equation:

$$(average)soil\ density\ \left(\frac{g}{cm^3}\right) *\ soil\ volume\ (ft^3) *\ ft^3\ to\ cm^3\ conversion\ factor\ \left(28{,}316.85\frac{cm^3}{ft^3}\right) *\ g\ to\ kg\ conversion\ \left(\frac{1\ kg}{1000\ g}\right) = soil\ mass\ (kg)$$

Once the soil mass was determined, the sample results from the April 2012 sampling event were used to calculate the estimated mass of each detected Aroclor within each of the sidewall sampling location intervals. The following equation was used to calculate the Aroclor mass:

$$soil\ PCB\ concentration\ \left(\frac{mg}{kg}\right) * soil\ mass\ (kg) *\ mg\ to\ kg\ conversion\ \left(\frac{1\ kg}{1{,}000{,}000\ mg}\right) = soil\ PCB\ mass\ (kg)$$

The soil Aroclor mass was multiplied by 2.205 to convert from kilogram to pounds. The intervals were then summed up for each sidewall location to determine an estimated mass for each detected Aroclor. The calculations for each sidewall location can be found in Attachment 2.

The following exceptions were made during the mass calculations:

- In the event duplicate samples were taken, the highest concentration values between the normal and duplicate samples were used in the calculation estimate to be conservative.
- When a discrete sample was taken from a smaller portion of a 2-foot interval, that interval was subtracted from the larger 2-foot interval sample, and masses were calculated separately for the discrete and remaining 2-foot interval samples.
- There was insufficient residual sediment along the sidewall at locations SB11 and SB12, so no sidewall samples were collected. The incremental sampling results were used to calculate mass estimates from 1,400 to 2,700 feet (Figure 1). Incremental sampling result DU01 was used for Ball's Beach, and DU06 was used for Boy Scout Beach.

Mass Estimate

Table 2 summarizes the mass estimate for each Aroclor at its respective sidewall location.

TABLE 2
Mass Estimate Summary
Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

Sidewall Location	PCB-1248 (pounds)	PCB-1254 (pounds)	PCB-1260 (pounds)
SB01	16.61	15.99	
SB02	10.27	15.32	
SB03	0.67	4.89	
SB04	3.68	3.23	
SB05	4.49	5.38	
SB06	1.31	1.20	
SB07	12.26	17.93	
SB08	0.07	1.02	
SB09	14.44	10.21	
SB10	1.00	1.37	
DU01	0.00	0.00	
DU06	0.08	0.06	
SB13	3.35	3.29	
SB14	2.99	3.31	
SB15	6.57	8.34	95.20
SB16	1.16	1.88	0.21
SB17	107.43	106.25	
SB18	1.00	2.20	
SB19	206.67	178.21	

TABLE 2
Mass Estimate Summary
Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

Sidewall Location	PCB-1248 (pounds)	PCB-1254 (pounds)	PCB-1260 (pounds)
SB20	0.15	0.19	
TOTAL	**394.19**	**380.24**	**95.41**

Sensitivity Analysis and Uncertainty

The estimation of chemical mass residing within an environmental medium is a function of multiple variables that exhibit both spatial and temporal variation. The primary variables for the analysis presented herein are the volume of impacted soil/sediment along the valley walls, bulk density of the material, and chemical concentrations. All three of the variables (volume, density, and concentration) directly affect the mass calculation in that as each variable increases so does the mass. The method of estimating each variable is discussed in the following paragraphs relative to the impact on PCB mass.

Sediment volume: Sediment volume is determined by the geometry of the sand body. Field measurements were conducted at the exposed face to estimate the vertical thickness and the horizontal dimension at the top of the sand body, which was estimated as the former sediment surface prior to dredging. The underlying interface between the soil and the valley wall was estimated based upon visual observations made during the sampling effort. The volume of sediment will vary with the geometry of the cross section and uncertainty increases with the horizontal distance given the greater range in horizontal versus vertical distances measured. Sediment volume also varies with time given that some sections of the creek are actively eroding (for example, the shoal material road).

Surface area of the residual sediment on the valley wall was estimated from the field measurements as shown in Attachment 1. The geometry of the sediment volume varies considerably in thickness and in surface area. The area estimate has been provided in a range of values from 4.8 to 5.5 acres. The lower end of the range (4.8 acres) was estimated using the top width, whereas, the upper end of the range (5.5 acres) was estimated from the vertical interval with the greatest cross-sectional width. This estimate of area assumes a uniform width between the stations as indicated in Figure 1.

Density: Bulk density varies over the smallest range of the three variables and has the least impact on uncertainty of the estimate.

Concentration: The concentration term greatly impacts the mass estimate in that the variable is highly sensitive to spatial variation. Although there is some potential for degradation, the temporal component of variation is small given the stable nature of PCBs. Concentration measurements were collected at the exposed vertical face of each profile and those concentrations were assumed to be representative of a certain sediment volume extrapolated horizontally both parallel and perpendicularly to the creek.

An example of the potential variation in mass estimate was calculated using the single largest soil body that was evaluated at stations SB15, SB17, and SB19. The PCB mass estimated within this sediment body is 613 of the total 870 pounds. The maximum horizontal distance at the top of the soil surface was estimated at 145 feet at SB19. The underlying interface between the soil and the valley wall could not be determined during the sampling effort; therefore, an arbitrary value was chosen to demonstrate the impact of soil volume on the PCB mass estimate. If there was 50 percent less soil in the area of stations SB15, SB17, and SB19, the mass of PCB would be 515 pounds compared to original estimate of 870 pounds, a reduction of 41 percent.

Conclusion

The calculations presented in this memorandum indicate that at the time of sampling, approximately 870 pounds of PCB Aroclors remained in the stream banks between Station 0+00 and Station 53+50 within the project reach. The residual PCB mass of 870 pounds represents about 0.22 percent of the 400,000 pounds estimated to have

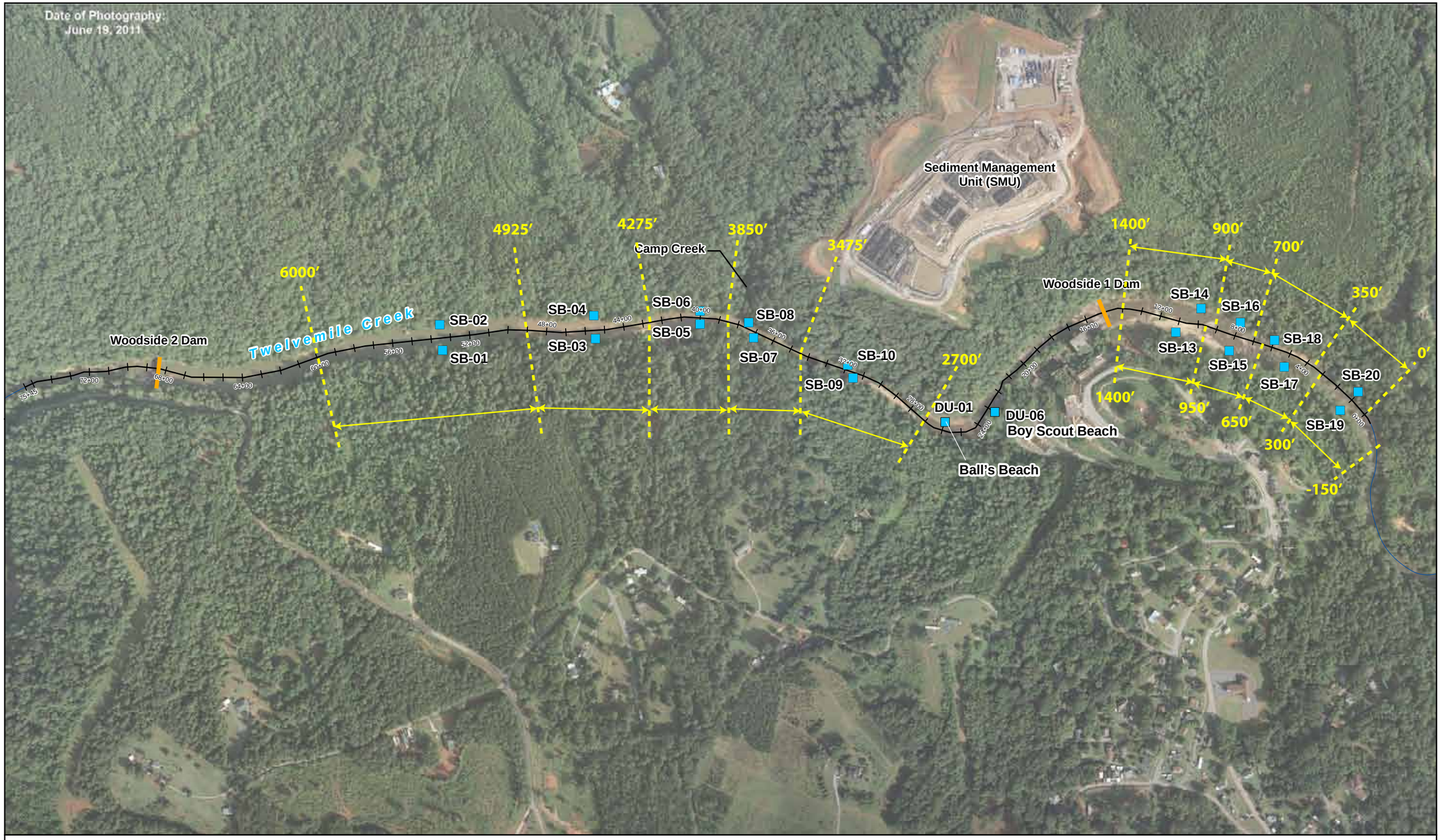
been discharged to Twelvemile Creek. It is also important to note that the greatest uncertainty in the mass estimate provided within this technical memorandum lies in the estimate of the sediment volume in the areas of stations SB15, SB17, and SB19. A change of 50 percent from the bottom and top of the sample interval width within the profile at these locations may result in a reduction of residual PCB mass from 870 to 515 pounds, which represents 0.13 percent of the total discharged mass. Also, given that Aroclor-1260 was not reportedly used at the Sangamo Weston plant, the table below shows the results of the mass estimate with and without Aroclor-1260 and the impact of the sensitivity analysis.

	PCB Mass including Aroclor-1260 (pounds)	**PCB Mass without Aroclor -1260 (pounds)**
Original estimate	870	774
Sensitivity estimate changing one variable (sediment volume)	515	468

References

American Society for Testing and Materials (ASTM). 2011. S*tandard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)*. Method D2487-11. http://www.astm.org/Standards/D2487.htm.

Bechtel. 1993. *Remedial Investigation Report for the Sangamo Weston, Inc./Twelvemile Creek/Hartwell Lake Site Operable Unit Two, Pickens, Pickens County, South Carolina*. May.



0 250 500 Feet

LEGEND

- Approximate Creek Centerline and Stationing
- Former Dam
- Creek Sidewall Profile Sample Location

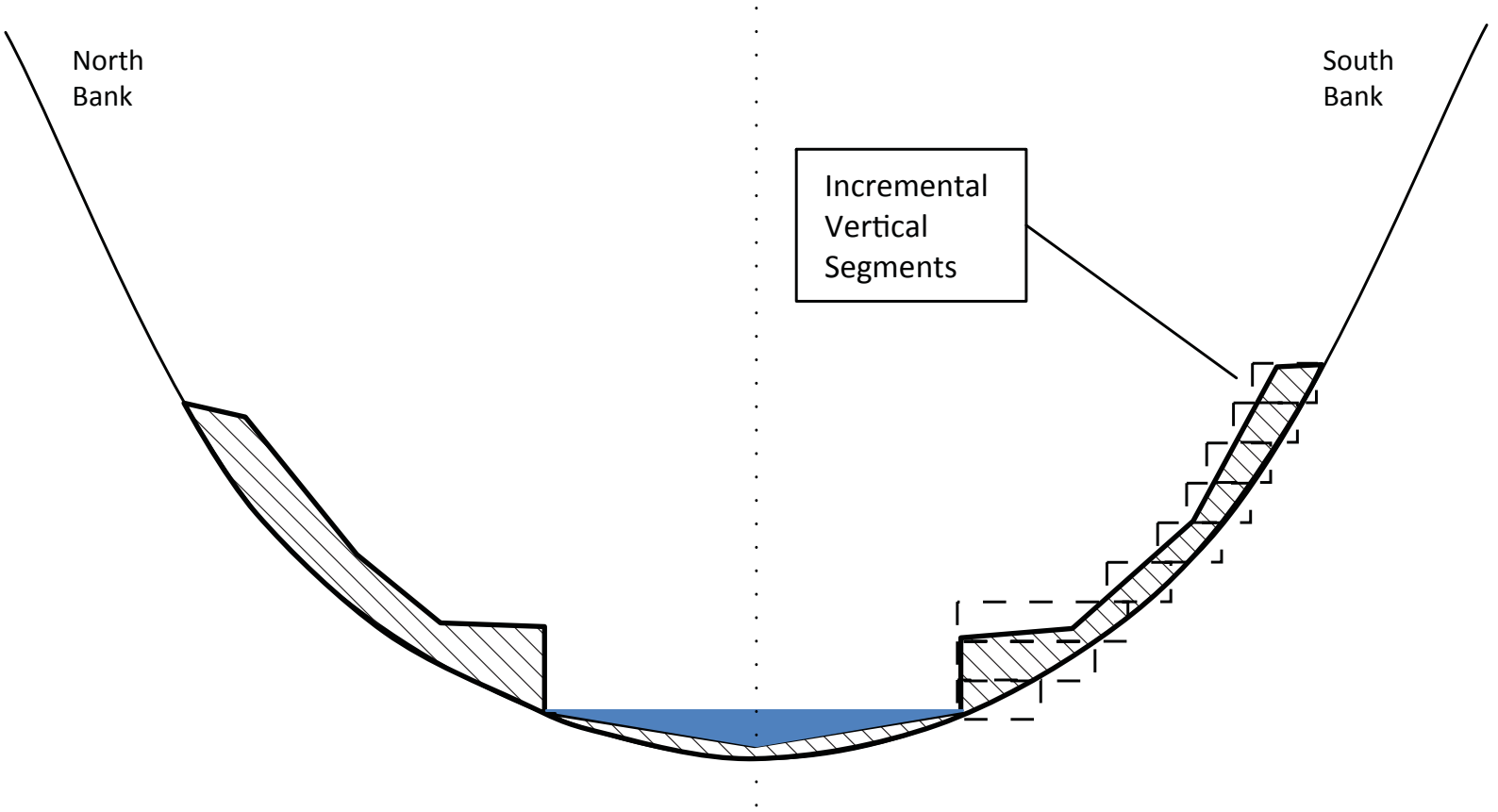
Notes:

1. Sample locations are approximate and were determined in the field by noting station location stakes. All locations are within +/-10 feet of the stated stake location. Due to the high sidewalls of the creek the handheld GPS unit was unable to receive signal to provide location information.
2. Sample location SB11 could not be sampled due to construction repairs and the presence of erosion control netting. Also, location SB12 could not be sampled due to the absence of soil/sediment at the rock outcrop. The omission of these sample locations was approved in the field by USEPA representatives.

Appendix E – Figure 1
Sidewall Profile Sample Locations
Mass Estimate Calculation Technical Memorandum
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

ES080712163202MKE F1_SidewallProfileSampLoc_as1_v2 10.14.12 sls

CH2MHILL



Appendix E – Figure 2
Typical Cross Section of Sampling Station
Mass Estimate Calculation Technical Memorandum
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

Attachment 1
Sediment Volume Calculations

APPENDIX E, ATTACHMENT 1—SEDIMENT VOLUME CALCULATIONS

Residual Sediment Volume Dimensions

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Profile No.	Vertical Dimension (ft)	Height (ft)	Location West (ft)	Locaton East (ft)	Cross Section Width (ft)	Volume (ft^3)	Surface Area[a] (ft^2)	Surface Area[b] (ft^2)
SB-01	2	2	6,000	4,925	10	21,500		10,750
	4	2	6,000	4,925	10	21,500		
	6	2	6,000	4,925	12	25,800		
	8	2	6,000	4,925	11	23,650		
	10	2	6,000	4,925	11	23,650		
	12	2	6,000	4,925	9	19,350		
	14	2	6,000	4,925	11	23,650		
	16	2	6,000	4,925	13	27,950		
	18	2	6,000	4,925	15	32,250		
	20	2	6,000	4,925	20	43,000		
	22	2	6,000	4,925	28	60,200	30,100	
	24	2	6,000	4,925	26	55,900		
Total Volume						378,400		
SB-02	2	2	6,000	4,925	9	19,350	9,675	9,675
	4	2	6,000	4,925	8	17,200		
	6	2	6,000	4,925	7	15,050		
	8	2	6,000	4,925	6	12,900		
	10	2	6,000	4,925	7	15,050		
	12	2	6,000	4,925	8	17,200		
	14	2	6,000	4,925	8	17,200		
	16	2	6,000	4,925	7	15,050		
	18	2	6,000	4,925	6	12,900		
Total Volume						141,900		
SB-03	2	2	4,925	4,275	9	11,700		5,850
	4	2	4,925	4,275	7	9,100		
	6	2	4,925	4,275	5	6,500		
	8	2	4,925	4,275	6	7,800		
	10	2	4,925	4,275	6	7,800		
	12	2	4,925	4,275	8	10,400		
	14	2	4,925	4,275	11	14,300	7,150	
	16	2	4,925	4,275	7	9,100		
Total Volume						76,700		
SB-04	2	2	4,925	4,275	7	9,100	4,550	4,550
	4	2	4,925	4,275	7	9,100		
	6	2	4,925	4,275	6	7,800		
	8	2	4,925	4,275	4	5,200		
	10	2	4,925	4,275	4	5,200		
	12	2	4,925	4,275	4	5,200		
	14	2	4,925	4,275	5	6,500		
	16	2	4,925	4,275	5	6,500		
	18	2	4,925	4,275	5	6,500		
	20	2	4,925	4,275	6	7,800		
	22	2	4,925	4,275	1	1,300		
Total Volume						70,200		

APPENDIX E, ATTACHMENT 1—SEDIMENT VOLUME CALCULATIONS

Residual Sediment Volume Dimensions

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Profile No.	Vertical Dimension (ft)	Height (ft)	Location West (ft)	Locaton East (ft)	Cross Section Width (ft)	Volume (ft^3)	Surface Area[a] (ft^2)	Surface Area[b] (ft^2)
SB-05	2	2	4,275	3,850	43	36,550	18,275	18,275
	4	2	4,275	3,850	39	33,150		
	6	2	4,275	3,850	34	28,900		
	8	2	4,275	3,850	32	27,200		
	10	2	4,275	3,850	33	28,050		
	12	2	4,275	3,850	13	11,050		
Total Volume						164,900		
SB-06	2	2	4,275	3,850	3	2,550		1,275
	4	2	4,275	3,850	3	2,550		
	6	2	4,275	3,850	2	1,700		
	8	2	4,275	3,850	3	2,550		
	10	2	4,275	3,850	12	10,200	5,100	
	12	2	4,275	3,850	8	6,800		
Total Volume						26,350		
SB-07	2	2	3,850	3,425	24	20,400	10,200	10,200
	4	2	3,850	3,425	23	19,550		
	6	2	3,850	3,425	18	15,300		
	8	2	3,850	3,425	16	13,600		
	10	2	3,850	3,425	13	11,050		
	12	2	3,850	3,425	2	1,700		
Total Volume						81,600		
SB-08	2	2	3,875	3,475	8	6,400	3,200	3,200
	4	2	3,875	3,475	7	5,600		
	6	2	3,875	3,475	5	4,000		
	8	2	3,875	3,475	5	4,000		
	10	2	3,875	3,475	4	3,200		
	12	2	3,875	3,475	3	2,400		
	14	2	3,875	3,475	1	800		
Total Volume						26,400		
SB-09	2	2	3,425	2,700	23	33,350	16,675	16,675
	4	2	3,425	2,700	19	27,550		
	6	2	3,425	2,700	17	24,650		
	8	2	3,425	2,700	20	29,000		
	10	2	3,425	2,700	18	26,100		
	12	2	3,425	2,700	8	11,600		
Total Volume						152,250		
SB-10	2	2	3,475	2,700	5	7,750		3,875
	4	2	3,475	2,700	5	7,750		
	6	2	3,475	2,700	4	6,200		
	8	2	3,475	2,700	4	6,200		
	10	2	3,475	2,700	6	9,300	4,650	
	12	2	3,475	2,700	3	4,650		
Total Volume						41,850		

APPENDIX E, ATTACHMENT 1—SEDIMENT VOLUME CALCULATIONS

Residual Sediment Volume Dimensions

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Profile No.	Vertical Dimension (ft)	Height (ft)	Location West (ft)	Locaton East (ft)	Cross Section Width (ft)	Volume (ft^3)	Surface Area[a] (ft^2)	Surface Area[b] (ft^2)
SB-13	2	2	1,400	950	7	6,300		3,150
	4	2	1,400	950	8	7,200		
	6	2	1,400	950	3	2,700		
	8	2	1,400	950	2	1,800		
	10	2	1,400	950	1	900		
	12	2	1,400	950	0	0		
	14	2	1,400	950	0	0		
	16	2	1,400	950	0	0		
	18	2	1,400	950	21	18,900	9,450	
Total Volume						37,800		
SB-14	2	2	1,400	900	9	9,000	4,500	4,500
	4	2	1,400	900	8	8,000		
	6	2	1,400	900	5	5,000		
	8	2	1,400	900	5	5,000		
	10	2	1,400	900	6	6,000		
	12	2	1,400	900	5	5,000		
	14	2	1,400	900	5	5,000		
	16	2	1,400	900	6	6,000		
	18	2	1,400	900	6	6,000		
	20	2	1,400	900	7	7,000		
	22	2	1,400	900	6	6,000		
	24	2	1,400	900	6	6,000		
	26	2	1,400	900	5	5,000		
	28	2	1,400	900	4	4,000		
	30	2	1,400	900	1	1,000		
Total Volume						84,000		
SB-15	2	2	950	650	59	35,400	17,700	17,700
	4	2	950	650	54	32,400		
	6	2	950	650	51	30,600		
	8	2	950	650	47	28,200		
	10	2	950	650	45	27,000		
	12	2	950	650	43	25,800		
	14	2	950	650	41	24,600		
	16	2	950	650	38	22,800		
	18	2	950	650	35	21,000		
	20	2	950	650	30	18,000		
	22	2	950	650	24	14,400		
	24	2	950	650	17	10,200		
	26	2	950	650	6	3,600		
Total Volume						294,000		

APPENDIX E, ATTACHMENT 1—SEDIMENT VOLUME CALCULATIONS

Residual Sediment Volume Dimensions

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Profile No.	Vertical Dimension (ft)	Height (ft)	Location West (ft)	Locaton East (ft)	Cross Section Width (ft)	Volume (ft^3)	Surface Area[a] (ft^2)	Surface Area[b] (ft^2)
SB-16	2	2	900	700	7	2,800	1,400	1,400
	4	2	900	700	5	2,000		
	6	2	900	700	4	1,600		
	8	2	900	700	4	1,600		
	10	2	900	700	3	1,200		
	12	2	900	700	5	2,000		
	14	2	900	700	4	1,600		
	16	2	900	700	4	1,600		
	18	2	900	700	3	1,200		
	20	2	900	700	2	800		
	22	2	900	700	1	400		
Total Volume						16,800		
SB-17	2	2	650	300	80	56,000	28,000	28,000
	4	2	650	300	72	50,400		
	6	2	650	300	66	46,200		
	8	2	650	300	59	41,300		
	10	2	650	300	54	37,800		
	12	2	650	300	50	35,000		
	14	2	650	300	42	29,400		
	16	2	650	300	35	24,500		
	18	2	650	300	27	18,900		
	20	2	650	300	17	11,900		
Total Volume						351,400		
SB-18	2	2	700	350	5	3,500		1,750
	4	2	700	350	8	5,600		
	6	2	700	350	7	4,900		
	8	2	700	350	5	3,500		
	10	2	700	350	10	7,000	3,500	
	12	2	700	350	10	7,000		
	14	2	700	350	8	5,600		
	16	2	700	350	8	5,600		
	18	2	700	350	6	4,200		
Total Volume						46,900		
SB-19	2	2	300	-150	144	129,600	64,800	64,800
	4	2	300	-150	142	127,800		
	6	2	300	-150	140	126,000		
	8	2	300	-150	140	126,000		
	10	2	300	-150	138	124,200		
	12	2	300	-150	135	121,500		
	14	2	300	-150	134	120,600		
	16	2	300	-150	129	116,100		
	18	2	300	-150	32	28,800		
Total Volume						1,020,600		

APPENDIX E, ATTACHMENT 1—SEDIMENT VOLUME CALCULATIONS

Residual Sediment Volume Dimensions

Supplemental Remedial Investigation

Operable Unit 2 of the Twelvemile Creek Site, Pickens County, South Carolina

Profile No.	Vertical Dimension (ft)	Height (ft)	Location West (ft)	Locaton East (ft)	Cross Section Width (ft)	Volume (ft^3)	Surface Area[a] (ft^2)	Surface Area[b] (ft^2)
SB-20	2	2	350	0	5	3,500		1,750
	4	2	350	0	4	2,800		
	6	2	350	0	6	4,200	2,100	
	8	2	350	0	5	3,500		
	10	2	350	0	2	1,400		
Total Volume						15,400		
Total Volume (ft^3)						3,012,050		
Total Area (ft^2)							241,025	207,375
Total Area (acres)							5.5	4.8

Sensitivity Analysis

[a]Surface area estimated using maximum interval width

[b]Surface area estimated using top interval width

Attachment 2
Mass Calculations

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg		Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB01-0002	0 - 2			**0.25**															
TMC-SB01P-0002	0 - 2			**0.35**				00-02	SW	1.42	1.42	21,500	864,513	0.00	0.30		0.00	0.67	
TMC-SB01-0204	2 - 4			**0.55**				02-04	SW	1.42	1.42	21,500	864,513	0.00	0.48		0.00	1.05	
TMC-SB01-0406	4 - 6			**0.54**				04-06	SW	1.42	1.42	25,800	1,037,416	0.00	0.56		0.00	1.24	
TMC-SB01-0608	6 - 8			**0.65**				06-08	SM	1.13	1.13	23,650	753,405	0.00	0.49		0.00	1.08	
TMC-SB01-0810	8 - 10			**0.68**				08-10	SM	1.13	1.13	23,650	753,405	0.00	0.51		0.00	1.13	
TMC-SB01-1012	10 - 12	**1**	J	**0.63**	J			10-12	SW-SM	1.27	1.27	19,350	697,242	0.70	0.44		1.54	0.97	
TMC-SB01-1214	12 - 14			**0.021**	J			12-14	SP	1.42	1.42	23,650	950,965	0.00	0.02		0.00	0.04	
TMC-SB01-1416	14 - 16	**0.34**		**0.28**				14-15	SP	1.42	1.27	27,950	1,007,128	0.34	0.28		0.76	0.62	
								15-16	SM	1.13									
TMC-SB01-1618	16 - 17, 17.5-18	**0.96**	J	**0.61**	J			16-18	SM	1.13	1.13	24,188	770,528	0.74	0.47		1.63	1.04	
TMC-SB01-1717_5-D	17 - 17.5	**4.4**		**2.8**					SM	1.13	1.13	8,063	256,843	1.13	0.72		2.49	1.59	
TMC-SB01-1820	18 - 20	**0.13**		**0.076**				18-20	SW	1.42	1.42	43,000	1,729,027	0.22	0.13		0.50	0.29	
TMC-SB01-2022	20 - 22	**0.52**	J	**0.31**	J			20-21	SW	1.42	1.35	60,200	2,294,918	1.19	0.71		2.63	1.57	
								21-22	SW-SM	1.27									
TMC-SB01-2224	22 - 24	**1.8**		**1.2**				22-24	ML	1.13	1.13	55,900	1,780,776	3.21	2.14		7.07	4.71	
Total														**7.53**	**7.25**		**16.61**	**15.99**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg		Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB02-0002	0-2	0.5		**0.61**				00-02	SM	1.13	1.13	19,350	616,422	0.31	0.38		0.68	0.83	
TMC-SB02-0204	2-4	**0.7**		**0.64**				02-2.4	SM	1.13	1.32	17,200	644,915	0.45	0.41		1.00	0.91	
								2.4-2.9	SW-ML	1.27									
								2.9-4	SW	1.42									
TMC-SB02-0406	4-6	0.034		**0.018**	J			04-06	SW	1.42	1.42	15,050	605,159	0.02	0.01		0.05	0.02	
TMC-SB02-0608	6-8	0.21		**0.12**				06-08	SW	1.42	1.42	12,900	518,708	0.11	0.06		0.24	0.14	
TMC-SB02-0810	8-10	0.9		**0.5**				08-09	SW	1.42	1.42	15,050	605,159	0.54	0.30		1.20	0.67	
								09-10	ML	1.13									
TMC-SB02-1012	10-12			**5.1**				10-12	ML	1.13	1.13	17,200	547,931	0.00	2.79		0.00	6.16	
TMC-SB02-1214	12-12.5, 13-14	2.4		**1.6**				12-12.5	SW	1.42	1.22	12,900	446,868	1.07	0.71		2.36	1.58	
								13-14	ML	1.13									
TMC-SB02-12_513-D	12.5-13	3.1		**2**				12.5-13	ML	1.13	1.13	4,300	136,983	0.42	0.27		0.94	0.60	
TMC-SB02-1416	14-16	3.6		**2.2**				14-16	ML	1.13	1.13	15,050	479,440	1.73	1.05		3.81	2.33	
TMC-SB02-1618	16-18			**2.3**	J			16-18	ML	1.13	1.13	12,900	410,948	0.00	0.95		0.00	2.08	
Total														**4.66**	**6.95**		**10.27**	**15.32**	

Sample ID	Sample Interval	PCB-1248 mg/kg	PCB-1254 mg/kg		PCB-1260 mg/kg		Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB03-0002	0 - 2		**0.61**				00-02	SM	1.13	1.13	11,700	372,721	0.00	0.23		0.00	0.50	
TMC-SB03-0204	2 - 4		**0.92**				02-04	SM	1.13	1.13	9,100	289,894	0.00	0.27		0.00	0.59	
TMC-SB03-0406	4 - 6	**1.2**	**0.89**				04-06	SM	1.13	1.13	6,500	207,067	0.25	0.18		0.55	0.41	
TMC-SB03-0608	6 - 8	**0.18**	**0.11**				06-6.5	ML	1.13	1.35	7,800	297,348	0.05	0.03		0.12	0.07	
							6.5-08	SW	1.42									
TMC-SB03-0810	8 - 10						08-10	ML	1.13	1.13	7,800	248,480	0.00	0.00		0.00	0.00	
TMC-SB03-0995-D	9 - 9.5																		
TMC-SB03-1012	10 - 12						10-11	ML	1.13	1.27	10,400	374,745	0.00	0.00		0.00	0.00	
							11-12	SW	1.42									
TMC-SB03-1214	12 - 14		**2.9**				12-13.2	ML	1.13	1.13	14,300	455,547	0.00	1.32		0.00	2.91	
							13.2-14.2	SM	1.13									
TMC-SB03-1416	14 - 16		**0.64**	J			14.2-16	ML	1.13	1.13	9,100	289,894	0.00	0.19		0.00	0.41	
Total													**0.30**	**2.22**		**0.67**	**4.89**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB04-0002	0 - 2			**0.62**			00-02	SM	1.13	1.13	9,100	289,894	0.00	0.18		0.00	0.40	
TMC-SB04P-0002	0 - 2	**0.38**		**0.56**			00-02	SM	1.13	1.13	9,100	289,894	0.11			0.24		
TMC-SB04-0204	2 - 4	**0.5**		**0.6**			02-04	SM	1.13	1.13	9,100	289,894	0.14	0.17		0.32	0.38	
TMC-SB04-0406	4 - 6	**3.4**	J	**2.6**	J		04-06	SM	1.13	1.13	7,800	248,480	0.84	0.65		1.86	1.42	
TMC-SB04-0608	6 - 8	**2**	J	**1.6**	J		06-08	SM	1.13	1.13	5,200	165,654	0.33	0.27		0.73	0.58	
TMC-SB04-0810	8 - 10	**0.82**		**0.53**			08-8.5	SM	1.13	1.35	5,200	198,232	0.16	0.11		0.36	0.23	
							8.5-10	SW	1.42									
TMC-SB04-1012	10 - 12	**0.22**		**0.13**			10-12	SW	1.42	1.42	5,200	209,092	0.05	0.03		0.10	0.06	
TMC-SB04-1212_4-D	12 - 12.4																	
TMC-SB04-1214	12 - 14	**0.12**		**0.057**			12-12.4	ML	1.13	1.36	6,500	250,505	0.03	0.01		0.07	0.03	
							12.4-14	SW	1.42									
TMC-SB04-1416	14 - 16						14-16	SW	1.42	1.42	6,500	261,365	0.00	0.00		0.00	0.00	
TMC-SB04-1618	16 - 18			**0.019**	J		16-18	SW	1.42	1.42	6,500	261,365	0.00	0.00		0.00	0.01	
TMC-SB04-1819	18 - 19			**0.31**	J		18-19	SW	1.42	1.42	3,900	156,819	0.00	0.05		0.00	0.11	
TMC-SB04-2224	22 - 24						22-24	ML	1.13	1.13	N/A	N/A	N/A	N/A		N/A	N/A	
Total													**1.67**	**1.46**		**3.68**	**3.23**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB05-0002	**0 - 2**			**0.17**			**00-02**	**SM**	**1.13**	**1.13**								
TMC-SB05P-0002	0 - 2			**0.21**			00-02	SM	1.13	1.13	36,550	1,164,353	0.00	0.24		0.00	0.54	
TMC-SB05-0204	2 - 4			**0.36**			02-04	SM	1.13	1.13	33,150	1,056,042	0.00	0.38		0.00	0.84	
TMC-SB05-0406	4 - 6			**0.57**			04-06	SM	1.13	1.13	28,900	920,652	0.00	0.52		0.00	1.16	
TMC-SB05-0608	6 - 8	**0.88**	J	**0.61**	J		06-6.5	ML	1.13	1.35	27,200	1,036,906	0.91	0.63		2.01	1.39	
							6.5-08	SW	1.42									
TMC-SB05-0810	8 - 9.5	**0.8**	J	**0.45**	J		08-8.7	SM	1.13	1.22	21,038	728,759	0.58	0.33		1.29	0.72	
							8.7-9.2	SW	1.42									
							9.2-9.5	ML	1.13									
TMC-SB05-09_510-D	9.5 - 10	**0.72**	J	**0.44**	J		9.5-10	ML	1.13	1.13	7,013	223,393	0.16	0.10		0.35	0.22	
TMC-SB05-1012	10 - 12	**0.87**	J	**0.53**	J		10-10.2	ML	1.13	1.39	11,050	435,089	0.38	0.23		0.83	0.51	
							10.2-12	SP	1.42									
Total													**2.03**	**2.44**		**4.49**	**5.38**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB06-0002	0 - 2			**0.35**			00-02	SM	1.13	1.13	2,550	81,234	0.00	0.03		0.00	0.06	
TMC-SB06P-0002	0 - 2			**0.3**			00-02	SM	1.13	1.13								
TMC-SB06-0204	2 - 4			**0.75**			02-04	SM	1.13	1.13	2,550	81,234	0.00	0.06		0.00	0.13	
TMC-SB06-0406	4 - 6			**1.5**	J		04-06	SM	1.13	1.13	1,700	54,156	0.00	0.08		0.00	0.18	
TMC-SB06-0607	6 - 7	**2.4**		**2.1**			06-07	SM	1.13	1.13	1,275	40,617	0.10	0.09		0.21	0.19	
TMC-SB06-0810	8 - 10	**0.084**		**0.08**			08-10	SW	1.42	1.42	10,200	410,141	0.03	0.03		0.08	0.07	
TMC-SB06-1012	10-11, 11.5-12	**1.9**	J	**1.1**	J		10-11	SW	1.42	1.22	5,100	176,669	0.34	0.19		0.74	0.43	
							11.5-12	ML	1.13									
TMC-SB06-1111_5-D	11 - 11.5	**2.3**	J	**1.1**	J		11-11.5	ML	1.13	1.13	1,700	54,156	0.12	0.06		0.27	0.13	
Total													**0.59**	**0.54**		**1.31**	**1.20**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB07-0002	0 - 2	**4.3**		**6.2**			00-02	SM	1.13	1.13								
TMC-SB07P-0002	0 - 2	**4.7**		**6.7**			00-02	SM	1.13	1.13	20,400	649,872	3.05	4.35		6.73	9.60	
TMC-SB07-0204	2 - 4	**2.3**		**4.1**			02-04	SM	1.13	1.13	19,550	622,794	1.43	2.55		3.16	5.63	
TMC-SB07-0406	4 - 6	**0.81**		**1.4**			04-06	SM	1.13	1.13	15,300	487,404	0.39	0.68		0.87	1.50	
TMC-SB07-0608	6 - 8			**0.19**			06-08	SW	1.42	1.42	13,600	546,855	0.00	0.10		0.00	0.23	
TMC-SB07-0810	8 - 10	**1.8**	J	**1.2**	J		08-10	ML	1.13	1.13	8,288	264,010	0.48	0.32		1.05	0.70	
TMC-SB07-09_510-D	9.5 - 10	**1.8**	J	**1.1**	J		9.5-10	ML	1.13	1.13	2,763	88,003	0.16	0.10		0.35	0.21	
TMC-SB07-1011	10 - 11	**0.64**		**0.36**			10-11	SW	1.42	1.42	1,700	68,357	0.04	0.02		0.10	0.05	
Total													**5.56**	**8.13**		**12.26**	**17.93**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB08-0000_5	0 - 0.5																	
TMC-SB08-0002	0 - 2			**0.22**			00-02	SM	1.13	1.13	6,400	203,881	0.00	0.04		0.00	0.10	
TMC-SB08-0204	2 - 4			**1.3**			02-04	SM	1.13	1.13	5,600	178,396	0.00	0.23		0.00	0.51	
TMC-SB08-0406	4 - 6			**0.18**			04-06	SM	1.13	1.13	4,000	127,426	0.00	0.02		0.00	0.05	
TMC-SB08-0608	6 - 8			**0.43**			06-6.5	SM	1.13	1.35	4,000	152,486	0.00	0.07		0.00	0.14	
							6.5-07	SW	1.42									
							07-08	SW	1.42									
TMC-SB08-0810	8 - 10			**0.56**			08-10	SW	1.42	1.42	3,200	128,672	0.00	0.07		0.00	0.16	
TMC-SB08-1012	10-11, 11.5-12	**0.35**		**0.25**			10-11	SW	1.42	1.32	1,800	67,366	0.02	0.02		0.05	0.04	
							11-12	SM	1.13									
TMC-SB08-1111_5-D	11 - 11.5	**0.18**		**0.14**			11-11.5	SM	1.13	1.13	600	19,114	0.00	0.00		0.01	0.01	
TMC-SB08-11_512	11.5 - 12																	
TMC-SB08-1214	12 - 14	**0.13**		**0.14**			12-14	SM	1.13	1.13	800	25,485	0.00	0.00		0.01	0.01	
TMC-SB08-1415	14 - 15	**0.3**		**0.25**														
Total													**0.03**	**0.46**		**0.07**	**1.02**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB09-0002	0 - 2	**0.76**		**0.77**			00-02	SM-SW	1.27	1.27								
TMC-SB09D-0002	0 - 2	**1.2**		**1.2**			00-02	SM-SW	1.27	1.27	33,350	1,201,707	1.44	1.44		3.18	3.18	
TMC-SB09-0204	2 - 4	**3.3**		**2**			02-04	SM-SW	1.27	1.27	27,550	992,714	3.28	1.99		7.22	4.38	
TMC-SB09-0406	4 - 6	**0.11**	J	**0.092**	**J**		04-06	SM-SW	1.27	1.27	24,650	888,218	0.10	0.08		0.22	0.18	
TMC-SB09-0608	6 - 8	**1.1**	J	**0.73**	**J**		06-07	SM-SW	1.27	1.35	29,000	1,105,525	1.22	0.81		2.68	1.78	
							07-08	SW	1.42									
TMC-SB09-0810	8 - 10	**0.25**		**0.17**			08-8.5	SM-ML	1.13	1.20	26,100	885,960	0.22	0.15		0.49	0.33	
							8.5-09	SW	1.42									
							09-10	SM	1.13									
TMC-SB09-1010_5-D	10 - 10.5	**1.3**	J	**0.69**	**J**		10-10.5	ML	1.13	1.13	2,900	92,384	0.12	0.06		0.26	0.14	
TMC-SB09-1012	10.5-12	**0.54**	J	**0.3**	**J**		10.5-11	ML	1.13	1.32	8,700	325,601	0.18	0.10		0.39	0.22	
							11-12	SP	1.42									
Total													**6.55**	**4.63**		**14.44**	**10.21**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB10-0002	0 - 2			**0.38**			00-02	SM	1.13	1.13	7,750	246,888	0.00	0.09		0.00	0.21	
TMC-SB10-0204	2 - 4			**0.29**			02-04	SM	1.13	1.13	7,750	246,888	0.00	0.07		0.00	0.16	
TMC-SB10-0406	4 - 6			**0.83**			04-06	SM	1.13	1.13	6,200	197,510	0.00	0.16		0.00	0.36	
TMC-SB10-0608	6 - 8			**0.48**			06-08	SM	1.13	1.13	6,200	197,510	0.00	0.09		0.00	0.21	
TMC-SB10-0810	8 - 10	**0.31**	J	**0.24**	J		08-10	SW	1.42	1.42	9,300	373,952	0.12	0.09		0.26	0.20	
TMC-SB10-088_5	8 - 8.5																	
TMC-SB10-1010_5-D	10 - 10.5	**2.3**	J	**1.5**	J		10-10.5	PT	1.13	1.13	1,163	37,033	0.09	0.06		0.19	0.12	
TMC-SB10-1012	10.5-12	**2.1**	J	**1.2**	J		10-10.5	PT	1.13	1.22	3,488	120,810	0.25	0.14		0.56	0.32	
							10.5-11	SW	1.42									
							11-12	ML	1.13									
Total													**0.45**	**0.62**		**1.00**	**1.37**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
DU01 (Ball's Beach)	0-0.5	0.14	J	0.14	J			SW	1.42	1.42	12,600	506,645	0.07	0.07		0.16	0.16	
Total													**0.07**	**0.07**		**0.16**	**0.16**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
DU06 (Boy Scout Beach)	0-0.5	0.071	J	0.05	J			SW	1.42	1.42	12,600	506,645	0.04	0.03		0.08	0.06	
Total													**0.04**	**0.03**		**0.08**	**0.06**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB13-0002	0 - 2			**0.27**	J													
TMC-SB13P-0002	0 - 2	**1.5**		**1.9**	J		00-02	SM	1.13	1.13	6,300	200,696	0.30	0.38		0.66	0.84	
TMC-SB13-0204	2 - 4	**3.3**		**3.3**			02-04	SM	1.13	1.13	7,200	229,366	0.76	0.76		1.67	1.67	
TMC-SB13-0406	4 - 6	**2.4**	J	**2.4**	J		04-06	SM	1.13	1.13	2,700	86,012	0.21	0.21		0.46	0.46	
TMC-SB13-0608	6 - 8	**0.4**		**0.33**			06-08	SM	1.13	1.13	1,800	57,342	0.02	0.02		0.05	0.04	
TMC-SB13-0810	8 - 10	**0.47**	J	**0.35**	J		08-09	SW	1.42	1.42	450	18,094	0.01	0.01		0.02	0.01	
							09-10	SAPROCK										
TMC-SB13-1012	10 - 12	**0.11**		**0.1**			10-12	SAPROCK			0	0	0.00	0.00		0.00	0.00	
TMC-SB13-1212_5-D	12 - 12.5	**0.078**		**0.062**			12-12.5	SAPROCK			0	0	0.00	0.00		0.00	0.00	
TMC-SB13-1416	14 - 16	**2.4**	J	**1.4**	J		14-15.5	GNEISS			0	0	0.00	0.00		0.00	0.00	
							15.5-16	SM	1.13									
TMC-SB13-1618	16 - 18			**0.0086**	J		16-18	SW	1.42		0	0	0.00	0.00		0.00	0.00	
TMC-SB13-1820	18 - 19.5	**0.25**		**0.13**			18-19.5	SW	1.42	1.42	14,175	569,976	0.14	0.07		0.31	0.16	
TMC-SB13-19_520-D	19.5 - 20	**0.54**		**0.31**			19.5-20	ML	1.13	1.13	4,725	150,522	0.08	0.05		0.18	0.10	
Total													**1.52**	**1.49**		**3.35**	**3.29**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB14-0002	0 - 2			**0.48**			00-02	SM	1.13	1.13	9,000	286,708	0.00	0.14		0.00	0.30	
TMC-SB14P-0002	0 - 2			**0.47**														
TMC-SB14-0204	2 - 4	**2**		**2.4**			02-04	SM	1.13	1.13	8,000	254,852	0.51	0.61		1.12	1.35	
TMC-SB14-0406	4 - 6	**0.025**	J	**0.045**	J		04-06	SW	1.42	1.42	5,000	201,050	0.01	0.01		0.01	0.02	
TMC-SB14-0608	6 - 8	**0.014**	J	**0.028**	J		06-08	SW	1.42	1.42	5,000	201,050	0.00	0.01		0.01	0.01	
TMC-SB14-0810	8 - 10	**0.017**	J	**0.034**	J		08-10	SW	1.42	1.42	6,000	241,260	0.00	0.01		0.01	0.02	
TMC-SB14-1012	10 - 12	**0.021**	J	**0.045**	J		10-12	SW	1.42	1.42	5,000	201,050	0.00	0.01		0.01	0.02	
TMC-SB14-1214	12 - 14	**0.022**	J	**0.038**	J		12-14	SW	1.42	1.42	5,000	201,050	0.00	0.01		0.01	0.02	
TMC-SB14-1416	14 - 16	**0.045**	J	**0.05**	J		14-16	SW	1.42	1.42	6,000	241,260	0.01	0.01		0.02	0.03	
TMC-SB14-1618	16 - 18	**0.58**		**0.4**			16-18	SW	1.42	1.42	6,000	241,260	0.14	0.10		0.31	0.21	
TMC-SB14-1820	18 - 20	**0.65**		**0.49**			18-19	SW	1.42	1.39	7,000	275,622	0.18	0.14		0.40	0.30	
							19-19.2	ML	1.13									
							19.2-20	SW	1.42									
TMC-SB14-2020_5-D	20 - 20.5	**1.9**	J	**1.7**			20-20.5	SM-ML	1.13	1.13	1,500	47,785	0.09	0.08		0.20	0.18	
TMC-SB14-2022	20.5 - 22	**0.89**		**0.91**			20.5-22	SM-ML	1.13	1.13	4,500	143,354	0.13	0.13		0.28	0.29	
TMC-SB14P-2022	20 - 22	**0.83**		**0.87**														
TMC-SB14-2224	22 - 24	**0.19**		**0.24**			22-24	SM-ML	1.13	1.13	6,000	191,139	0.04	0.05		0.08	0.10	
TMC-SB14-2426	24 - 26	**0.11**		**0.17**			24-26	SW	1.42	1.42	5,000	201,050	0.02	0.03		0.05	0.08	
TMC-SB14-2628	26 - 28	**0.78**	J	**0.68**	J		26-28	SM	1.13	1.13	4,000	127,426	0.10	0.09		0.22	0.19	
TMC-SB14-2830	28 - 30	**3.8**		**2.8**			28-30	SM	1.13	1.13	1,000	31,856	0.12	0.09		0.27	0.20	
TMC-SB14-3031	30 - 31						30-31	SW	1.42	1.42								
Total													**1.36**	**1.50**		**2.99**	**3.31**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg		Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB15-0002	0 - 2			**0.19**				00-0.8	SM	1.13	1.30	35,400	1,305,146	0.00	0.25	0.00	0.00	0.55	0.00
								0.8-02	SW	1.42									
TMC-SB15P-0002	0 - 2	**0.13**		**0.15**				00-0.8	SM	1.13	1.30	35,400	1,305,146	0.17	0.00	0.00	0.37	0.00	0.00
								0.8-02	SW	1.42									
TMC-SB15-0204	2 - 4			**0.024**	J			02-04	SW	1.42	1.42	32,400	1,302,802	0.00	0.03	0.00	0.00	0.07	0.00
TMC-SB15-0406	4 - 6			**0.023**	J			04-06	SW	1.42	1.42	30,600	1,230,424	0.00	0.03	0.00	0.00	0.06	0.00
TMC-SB15-0608	6 - 8			**0.023**	J			06-08	SW	1.42	1.42	28,200	1,133,920	0.00	0.03	0.00	0.00	0.06	0.00
TMC-SB15-0810	8 - 10	**1.2**		**0.85**				08-10	ML	1.13	1.13	27,000	860,124	1.03	0.73	0.00	2.28	1.61	0.00
TMC-SB15-1012	10 - 12					**52**		10-12	ML	1.13	1.13	25,800	821,897	0.00	0.00	42.74	0.00	0.00	94.24
TMC-SB15-1214	12 - 14			**1.8**	J	**0.49**	J	12-13	ML	1.13	1.27	24,600	886,417	0.00	1.60	0.43	0.00	3.52	0.96
								13-14	SW	1.42									
TMC-SB15-1414_5D	14 - 14.5	**1.2**	J	**1.1**	J			14-14.5	PT	1.13	1.13	5,700	181,582	0.22	0.20	0.00	0.48	0.44	0.00
TMC-SB15-1416	14.5 - 16	**1.5**	J	**0.81**	J			14.5-16	SW	1.42	1.42	17,100	687,590	1.03	0.56	0.00	2.27	1.23	0.00
TMC-SB15-1618	16 - 18	**0.26**		**0.17**				16-18	SW	1.42	1.42	21,000	844,408	0.22	0.14	0.00	0.48	0.32	0.00
TMC-SB15-1820	18 - 20	**0.13**		**0.099**				18-20	SW	1.42	1.42	18,000	723,779	0.09	0.07	0.00	0.21	0.16	0.00
TMC-SB15-2022	20 - 22	**0.076**		**0.048**				20-22	SW	1.42	1.42	14,400	579,023	0.04	0.03	0.00	0.10	0.06	0.00
TMC-SB15-2224	22 - 24	**0.42**		**0.3**				22-24	SW	1.42	1.42	10,200	410,141	0.17	0.12	0.00	0.38	0.27	0.00
Total														**2.98**	**3.78**	**43.17**	**6.57**	**8.34**	**95.20**

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg		Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB16-0002	0 - 2	**0.3**		**0.43**															
TMC-SB16P-0002	0 - 2	**0.46**		**0.62**				00-02	SM	1.13	1.13	2,800	89,198	0.04	0.06	0.00	0.09	0.12	0.00
TMC-SB16-0204	2 - 4			**0.33**				02-04	SM	1.13	1.13	2,000	63,713	0.00	0.02	0.00	0.00	0.05	0.00
TMC-SB16-0406	4 - 6			**8.6**				04-06	ML	1.13	1.13	1,600	50,970	0.00	0.44	0.00	0.00	0.97	0.00
TMC-SB16-0608	6 - 8			**0.02**	J			06-08	SW	1.42	1.42	1,600	64,336	0.00	0.00	0.00	0.00	0.00	0.00
TMC-SB16-0810	8 - 10			**0.093**				08-10	SW	1.42	1.42	1,200	48,252	0.00	0.00	0.00	0.00	0.01	0.00
TMC-SB16-1012	10 - 12	**3**	J	**2**	J	**0.82**	**J**	10-12	ML	1.13	1.13	2,000	63,713	0.19	0.13	0.05	0.42	0.28	0.12
TMC-SB16-1214	12 - 14	**3.2**	J	**1.6**	J	**0.38**	**J**	12-14	ML	1.13	1.13	1,600	50,970	0.16	0.08	0.02	0.36	0.18	0.04
TMC-SB16-1416	14-14.5, 15-16			**1.2**	J	**0.52**	J	14-14.5	ML	1.13	1.32	1,200	44,911	0.00	0.05	0.02	0.00	0.12	0.05
								15-16	SP	1.42									
TMC-SB16-14_515-D	14.5 - 15	**9.6**		**5.1**				14.5-15	ML	1.13	1.13	400	12,743	0.12	0.06	0.00	0.27	0.14	0.00
TMC-SB16-1618	16 - 18							16-18	SP	1.42	1.42	1,200	48,252	0.00	0.00	0.00	0.00	0.00	0.00
TMC-SB16-1820	18 - 20	**0.25**		**0.16**				18-20	SP	1.42	1.42	800	32,168	0.01	0.01	0.00	0.02	0.01	0.00
TMC-SB16-2021	20 - 21	**0.023**	J	**0.015**	J			20-21	SP	1.42	1.42	200	8,042	0.00	0.00	0.00	0.00	0.00	0.00
Total														**0.53**	**0.85**	**0.09**	**1.16**	**1.88**	**0.21**

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg		Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB17-0002	0 - 2	**1.3**		**1.4**															
TMC-SB17P-0002	0 - 2	**1.6**		**1.9**				00-02	SM	1.13	1.13	56,000	1,783,962	2.85	3.39		6.29	7.47	
TMC-SB17-0204	2 - 4	**5.1**		**5.8**				02-04	SM	1.13	1.13	50,400	1,605,565	8.19	9.31		18.06	20.53	
TMC-SB17-0406	4 - 6	**16**		**14**				04-06	SM	1.13	1.13	46,200	1,471,768	23.55	20.60		51.92	45.43	
TMC-SB17-0608	6 - 8	**2.8**		**2.9**				06-08	SW	1.42	1.42	41,300	1,660,670	4.65	4.82		10.25	10.62	
TMC-SB17-0810	8 - 10	**1.7**		**1.9**				08-10	SW	1.42	1.42	37,800	1,519,935	2.58	2.89		5.70	6.37	
TMC-SB17-1012	10 - 12	**1.7**		**1.8**				10-12	SW	1.42	1.42	35,000	1,407,347	2.39	2.53		5.28	5.59	
TMC-SB17-1214	12 - 14	**3.6**	J	**3.1**	J			12-14	SM	1.13	1.13	29,400	936,580	3.37	2.90		7.43	6.40	
TMC-SB17-1416	14 - 16	**0.9**		**0.9**				14-16	SW	1.42	1.42	24,500	985,143	0.89	0.89		1.96	1.96	
TMC-SB17-1618	16-17, 17.5-18	**0.36**		**0.39**				16-17	SW	1.42	1.42	14,175	569,976	0.21	0.22		0.45	0.49	
								17.5-18	SW	1.42									
TMC-SB17-1717_5-D	17 - 17.5	**0.27**		**0.45**				17-17.5	ML	1.13	1.13	4,725	150,522	0.04	0.07		0.09	0.15	
TMC-SB17-1820	18 - 20			**1.2**				18-19.8	SW	1.42	1.39	11,900	468,558	0.00	0.56		0.00	1.24	
								19.8-20	ML	1.13									
Total														**48.72**	**48.19**		**107.43**	**106.25**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB18-0002	0 - 2			**0.15**			00-02	SM	1.13	1.13	3,500	111,498	0.00	0.02		0.00	0.04	
TMC-SB18P-0002	0 - 2			**0.14**														
TMC-SB18-0204	2 - 4	**0.32**		**0.46**			02-04	SM	1.13	1.13	5,600	178,396	0.06	0.08		0.13	0.18	
TMC-SB18-0406	4 - 6			**0.32**			04-06	SM	1.13	1.13	4,900	156,097	0.00	0.05		0.00	0.11	
TMC-SB18-0608	6 - 8	**0.17**		**0.17**			06-08	SW	1.42	1.42	3,500	140,735	0.02	0.02		0.05	0.05	
TMC-SB18-0810	8 - 10	**0.4**		**0.34**			08-10	SW	1.42	1.42	7,000	281,469	0.11	0.10		0.25	0.21	
TMC-SB18-1012	10 - 12	**0.13**		**0.095**			10-12	SW	1.42	1.42	7,000	281,469	0.04	0.03		0.08	0.06	
TMC-SB18-1214	12-13, 13.5-14			**2.9**			12-13	SW	1.42	1.42	4,200	168,882	0.00	0.49		0.00	1.08	
							13.5-14	SW	1.42									
TMC-SB18-1313_5-D	13 - 13.5	**1.6**	J	**1.8**	J		13-13.5	ML	1.13	1.13	1,400	44,599	0.07	0.08		0.16	0.18	
TMC-SB18-1416	14 - 16	**0.5**		**0.47**			14-15	SW	1.42	1.27	5,600	201,786	0.10	0.09		0.22	0.21	
							15-16	ML	1.13									
TMC-SB18-1618	16 - 18	**0.3**		**0.24**			16-17	ML	1.13	1.27	4,200	151,339	0.00	0.04		0.00	0.08	
							17-18	SW	1.42									
TMC-SB18P-1618	16 - 18	**0.33**		**0.23**			16-17	ML	1.13	1.27	4,200	151,339	0.05	0.00		0.11	0.00	
							17-18	SW	1.42									
TMC-SB18-1819	18 - 19																	
Total													**0.45**	**1.00**		**1.00**	**2.20**	

Sample ID	Sample Interval	PCB-1248 mg/kg		PCB-1254 mg/kg		PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB19-0002	0-1, 1.5-2			**0.22**			00-01, 1.5-02	SM-ML	1.13	1.13	97,200	3,096,448	0.00	0.68		0.00	1.50	
TMC-SB19-011_5-D	1 - 1.5	**0.27**	J	**0.4**			01-1.5	SM-ML	1.13	1.13	32,400	1,032,149	0.28	0.41		0.61	0.91	
TMC-SB19P-0002	0 - 2			**0.2**														
TMC-SB19-0204	2 - 4	**0.1**		**0.18**			02-04	SM-ML	1.13	1.13	127,800	4,071,255	0.41	0.73		0.90	1.62	
TMC-SB19-0406	4 - 6	**3.1**		**3.2**			04-06	SM-ML	1.13	1.13	126,000	4,013,913	12.44	12.84		27.44	28.32	
TMC-SB19-0608	6 - 8	**13**		**11**			06-08	SM-ML	1.13	1.13	126,000	4,013,913	52.18	44.15		115.06	97.36	
TMC-SB19-0810	8 - 10	**5.4**		**3.3**	J		08-10	SM-ML	1.13	1.13	124,200	3,956,572	21.37	13.06		47.11	28.79	
TMC-SB19-1012	10 - 12	**0.66**		**0.81**			10-12	SM-ML	1.13	1.13	121,500	3,870,559	2.55	3.14		5.63	6.91	
TMC-SB19-1214	12 - 14	**0.72**	J	**0.98**	J		12-14	SM-ML	1.13	1.13	120,600	3,841,889	2.77	3.77		6.10	8.30	
TMC-SB19-1416	14 - 16	**0.43**		**0.51**			14-16	SM-ML	1.13	1.13	116,100	3,698,535	1.59	1.89		3.51	4.16	
TMC-SB19-1617	16 - 17	**0.31**		**0.33**			16-17	SM-ML	1.13	1.13	14,400	458,733	0.14	0.15		0.31	0.33	
Total													**93.73**	**80.82**		**206.67**	**178.21**	

Sample ID	Sample Interval	PCB-1248 mg/kg	PCB-1254 mg/kg	PCB-1260 mg/kg	Soil Interval	Soil Type	Density g/cm^3	Average Density g/cm^3	Soil Volume ft^3	Soil Mass kg	PCB-1248 kg	PCB-1254 kg	PCB-1260 kg	PCB-1248 lb	PCB-1254 lb	PCB-1260 lb
TMC-SB20-0002	0 - 2	**0.09**	**0.17**		00-02	SM	1.13	1.13	3,500	111,498	0.01	0.02		0.02	0.04	
TMC-SB20P-0002	0 - 2	**0.068**	**0.12**													
TMC-SB20-0204	2 - 4	**0.078**	**0.13**		02-04	SM	1.13	1.13	2,800	89,198	0.01	0.01		0.02	0.03	
TMC-SB20-0406	4 - 6	**0.15**	**0.19**		04-06	SW	1.42	1.42	4,200	168,882	0.03	0.03		0.06	0.07	
TMC-SB20-0608	6 - 8	**0.14**	**0.14**		06-08	SW	1.42	1.42	3,500	140,735	0.02	0.02		0.04	0.04	
TMC-SB20-0810	8 - 10	**0.14**	**0.16**		08-09	SW	1.42	1.42	700	28,147	0.00	0.00		0.01	0.01	
					09-10	SAPROCK										
TMC-SB20-9_510-D	9.5 - 10	**0.51**	**0.46**													
Total											**0.07**	**0.09**		**0.15**	**0.19**	

Appendix F
Human Health Risk Assessment

Report

Human Health Risk Assessment for Operable Unit 2 of the Sangamo Weston, Inc./Twelvemile Creek/Lake Hartwell Superfund Site Pickens County, South Carolina

Prepared for

Schlumberger Technology Corporation

September 2012

Prepared by

CH2MHILL

Contents

Acronyms and Abbreviations

AOI	area of interest
COC	chemical of concern
COPC	chemical of potential concern
CSF	cancer slope factor
CSM	conceptual site model
EC	exposure concentration
ELCR	excess lifetime cancer risk
EPC	exposure point concentration
ft^3/s	cubic feet per second
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IRIS	Integrated Risk Information System
IUR	inhalation unit risk
$\mu g/m^3$	microgram per cubic meter
mg/kg-day	milligram per kilogram per day
NCDC	National Climatic Data Center
OU2	operable unit 2
PCB	polychlorinated biphenyl
PEF	particulate emission factor
RAGS	Risk Assessment Guidance for Superfund
RfC	reference concentration
RfD	reference dose
RME	reasonable maximum exposure
RSL	Regional Screening Level
UCL	upper confidence limit
UFP QAPP	Uniform Federal Policy Quality Assurance Project Plan
USEPA	U.S. Environmental Protection Agency
WOE	weight of evidence

SECTION 1

Introduction

1.1 Overview

This human health risk assessment (HHRA) was prepared for Operable Unit 2 (OU2) of the Sangamo Weston, Inc./ Twelvemile Creek/Lake Hartwell Superfund Site, Pickens County, South Carolina. The objective of the HHRA is to provide information concerning polychlorinated biphenyl (PCB) concentrations within the project reach of OU2 of Twelvemile Creek. The approach and assumptions used in the HHRA were presented in the interim deliverable for the HHRA at OU2 (CH2M HILL 2012a). The interim deliverable included U.S. Environmental Protection Agency (USEPA) standard Tables 1 through 6 of the *Risk Assessment Guidance for Superfund (RAGS): Volume I—Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments)* (USEPA 2001).

In accordance with the USEPA guidance documents, this HHRA consists of a four-step evaluation process that comprises the following:

1. Data evaluation
2. Exposure assessment
3. Toxicity assessment
4. Risk characterization

1.2 Scope of the Risk Assessment

The HHRA was prepared in accordance with the interim deliverable and the *Draft Uniform Federal Policy Quality Assurance Project Plan (UFP QAPP) Site-specific Plans for Operable Unit 2 of the Twelvemile Creek Site* (CH2M HILL 2012a; 2012b). The following USEPA guidance documents were used in the preparation of the HHRA:

- *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual*, *Part A* (USEPA 1989)
- *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual*, *Supplemental Guidance, Standard Default Exposure Factors* (USEPA 1991)
- *Supplemental Guidance for Developing Soil Screening Levels* (USEPA 2002)
- *Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment Bulletins* (USEPA 2000)
- *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part D* (USEPA 2001)
- *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part E* (USEPA 2004)
- *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual, Part F* (USEPA 2009)

In addition, other USEPA guidance documents were used and are cited in the text and tables. The supporting tables for the HHRA are presented in RAGS Part D format (USEPA 2001) in Attachment F-1.

1.3 Potential Receptors

A site reconnaissance was performed on October 11 and 12, 2011, by the agencies and Schlumberger Technology Corporation to identify realistic current receptors and potential exposure areas. Recreational use is identified as the current and reasonably foreseeable future land use for the OU2 portion of Twelvemile Creek. The potential current and future receptors include kayakers/boaters (adults and adolescents [ages 6 to 16] and waders/sunbathers (adults and children [ages 0 to 6]). The preliminary human health conceptual site model (CSM) presents potential exposure media, exposure points, receptors (current and future), and exposure routes (Table 1 of Attachment F-1).

SECTION 2

Data Evaluation

2.1 Data Used in the HHRA

The analytical data used in the HHRA consist of the sediment data collected during the supplemental remedial investigation sampling conducted in April and May 2012. A summary of the data quality assessment is provided in Section 3.7 of the supplemental remedial investigation report. As indicated, the data were concluded to be appropriate for use in the HHRA.

Incremental samples were collected from exposed sediment (at a depth interval of 0 to 6 inches) at potential areas of interest (AOIs), and discrete submerged sediment samples were collected from a depth interval of 0 to 6 inches in Twelvemile Creek within the project reach. The incremental samples were collected from four AOIs (Ball's Beach, Boy Scout Beach, Woodside 1 Sandbar, and Cateechee Beach), selected based on their potential for sediment accumulation and for recreational use. Each AOI was divided into 0.2-acre sampling units. Submerged sediment sampling locations were selected using a systematic approach by collecting samples midstream at regular intervals along the project reach. The locations of the AOIs, incremental sample locations, and discrete submerged sediment sampling locations are depicted in Figure 1.

The sediment data set used in the HHRA consists of 6 exposed sediment samples (from the AOIs) and 14 submerged sediment samples. The sediment data were divided into two sample populations, Exposure Unit 1 and Exposure Unit 2, based on the recreational activities likely to occur at the site. Exposure Unit 1 was used to quantify potential exposures for potential current and future kayakers/boaters and includes all submerged sediment samples collected within the project reach and exposed sediment samples from the four AOIs. Exposure Unit 2 was used to quantify potential exposures for potential current and future waders/sunbathers and includes submerged sediment samples collected within 100 feet of the four AOIs and exposed sediment samples from the four AOIs. The sediment analytical data used in the HHRA for each exposure unit are provided in Attachment F-2.

The sediment samples were analyzed for seven PCB Aroclors, and only two of the seven Aroclors were detected in site sediment (Aroclor-1248 and Aroclor-1254). The detected Aroclor concentrations were summed on a sample-by-sample basis and evaluated as "total PCBs." A "total PCB" approach was used in the HHRA, as recommended by USEPA's PCB guidance (USEPA 1996). The Aroclor data and calculation of "total PCBs" per sample are provided in Attachment F-3.

2.2 Selection of Chemicals of Potential Concern

The chemicals of potential concern (COPCs) are chemicals that have the greatest potential to cause adverse human health effects if receptors come in contact with site media. The maximum detected concentration of each analyte in the site sediment samples was compared to its screening level to select the COPCs for each exposure unit. If the maximum detected concentration exceeded the screening level, the constituent was selected as a COPC. Aroclors that were 100 percent nondetected in site sediment at Exposure Units 1 and 2 were not selected as COPCs in the HHRA.

For samples with field duplicate analyses, the higher of the two concentrations was used when both values were detects, and the lower of the two reporting limits was used when both values were nondetects. In cases where one result was detected and the other nondetected, the detected value was used.

2.2.1 COPC Screening Levels

The regional screening levels (RSLs) for chemical contaminants at Superfund Sites (USEPA 2012a) were used to screen site data. Because some waders/sunbathers may be children, and due to the lack of sediment screening levels for human health, the residential soil RSLs were used in the COPC screening process. The RSLs are based on a target excess lifetime cancer risk (ELCR) of 1×10^{-6} and a noncancer hazard quotient (HQ) of 1. The RSLs for noncarcinogenic effects were adjusted by a factor of 0.1 to account for cumulative noncancer effects.

Generally, PCBs adsorbed to sediment tend to be of high chlorine content and persistence, especially for sediment with high levels of organic content (USEPA 1996). Persistence can be directly correlated with toxicity, although the two parameters are not always synonymous (USEPA 1996). Therefore, conservative screening levels (for high-potency PCBs) are used to evaluate sediment exposure pathways (USEPA 1996). Due to the lack of an RSL for "total PCBs," the residential soil RSLs for high-risk PCBs and Aroclor-1254 were considered as potential screening levels for "total PCBs." The adjusted RSL for Aroclor-1254, based on noncarcinogenic effects, was selected as the screening level for "total PCBs" because it is more conservative (that is, a lower value) than the carcinogenic-based RSL for high-risk PCBs.

2.2.2 COPC Screening Results

The analytes with maximum detected concentrations exceeding the adjusted RSLs were identified as COPCs for sediment. Results of the COPC screening process for Exposure Unit 1 (kayaker/boater) and Exposure Unit 2 (wader/sunbather) are presented in Tables 2.1 and 2.2 of Attachment F-1, respectively. Aroclor-1248, Aroclor-1254, and total PCBs were identified as COPCs in sediment for Exposure Unit 1 and Exposure Unit 2. Potential exposures and risks were quantified for Aroclor-1248 and Aroclor-1254 using the calculated "total PCBs" concentration in the HHRA.

2.3 Hot Spot Evaluation

In the HHRA interim deliverable, a review of site data was conducted to determine if potential hot spots were present in sediment that may require a separate exposure evaluation (Attachment F-4). The detected concentrations were compared to 100 times the adjusted residential soil RSLs (that is, resulting in an HQ = 10 and ELCR of 1×10^{-4}) to determine the presence (if any) of a discrete area where concentrations are considerably higher than those present in the surrounding area. The maximum detected concentrations of Aroclor-1248, Aroclor-1254, and total PCBs were less than 100 times their respective RSLs.[1] Therefore, no potential hot spots were identified for sediment at Exposure Unit 1 or Exposure Unit 2.

[1] More specifically, maximum detected concentrations were less than 10 times the adjusted residential soil RSL.

SECTION 3

Exposure Assessment

3.1 Exposure Pathways Quantified

An exposure pathway can be described as the physical course that a COPC takes from the point of release (or source) to a receptor. To be complete, an exposure pathway must have all of the following components:

- A source (such as constituent residues in sediment)
- A mechanism for chemical release and migration
- An environmental transport medium
- A point of potential human contact (such as sediment)
- A route of intake (such as ingestion)

In the absence of any one of these components, an exposure pathway is considered incomplete, and, by definition, there is no risk or hazard. In some cases, a receptor may contact a source directly, eliminating the release and transport pathways.

The potential exposure pathways for the site were identified in Table 1 in Attachment F-1. In accordance with the draft UFP QAPP (CH2M HILL 2012b), potential exposures were quantified for current and future kayakers/boaters and waders/sunbathers. The following are the potential exposure pathways quantified for each receptor group:

- **Kayakers/Boaters:** Ingestion, dermal contact, and inhalation exposures to PCBs in exposed (at the AOIs) and submerged sediment at Exposure Unit 1 were quantified for potential current and future adult and adolescent kayakers/boaters.
- **Waders/Sunbathers:** Ingestion, dermal contact, and inhalation exposures to PCBs in exposed (at the AOIs) and submerged sediment at Exposure Unit 2 were quantified for potential current and future adult and child waders/sunbathers. Although adolescents may also be present, the adult and child risk estimates can be used to conservatively represent potential adolescent risk estimates.

The receptor groups were identified as the likely current and future receptors at the site based on the site reconnaissance performed on October 11 and 12, 2011.

3.2 Quantification of Exposure

To evaluate the potentially complete exposure pathways further, the magnitude, frequency, and duration of exposures were estimated and quantified. Exposure point concentrations (EPCs) were identified and pathway-specific intakes were estimated. USEPA guidance (1989) recommends selecting intake variable values for a given pathway so that the combination of all intake variable values results in an estimate of the reasonable maximum exposure (RME) for that pathway. USEPA recommends using upper-bound parameter values (as opposed to average values) for exposure frequency and exposure duration and also recommends that the contact rate be a value representing the 95th percentile.

3.2.1 Exposure Point Concentrations

EPCs were estimated following the most recent parametric (distributional) and nonparametric USEPA recommendations in ProUCL Version 4.1.01 (USEPA 2011). ProUCL provides approaches for calculating 95 percent upper confidence limits (UCLs) of the mean, particularly when nondetected concentrations are present. The approaches consider a large variety of inputs, including the perceived distribution of the detected results (if no perceived distribution is acceptable, nonparametric alternatives are provided), sample size, variability, and skewness. Because at least 8 sediment samples were available for each exposure unit, and the 95 percent UCLs were less than the maximum detected concentrations, the 95th percent UCL of the mean was used as the EPC for

"total PCBs," consistent with USEPA guidance. The EPCs used in the intake and exposure calculations in the HHRA are included in Tables 3.1 and 3.2 of Attachment F-1. The ProUCL output is provided in Attachment F-5.

For Exposure Unit 1, the EPC was based on 6 incremental samples and 14 discrete samples; in Exposure Unit 2, the EPC was based on 6 incremental samples and 3 discrete samples. For both Exposure Units, the recommended EPC in the ProUCL output (Attachment F-5) was the 95 percent Approximate Gamma UCL, and this value was used in the intake estimates. Eight additional nonparametric 95 percent UCLs are available on the ProUCL output for each Exposure Unit; if a nonparametric 95 percent UCL was used as the EPC in the intake estimates (rather than the recommended Gamma UCL), the risk estimates would vary but remain within USEPA acceptable levels.

EPCs were determined based on measured "total PCBs" concentrations in sediment, while modeled EPCs were used to estimate air concentrations for potential ambient air exposures (from exposed sediment at AOIs). The modeled EPCs for ambient air were calculated using a site-specific particulate emission factor (PEF), as discussed in the following subsection, and are provided in Table 3.1 Supplement and 3.2 Supplement of Attachment F-1.

3.2.2 Exposure Factors

An RME scenario was quantified for potential current and future kayakers/boaters and waders/sunbathers (USEPA 1989). The exposure factors used in the intake calculations are presented in Tables 4.1 and 4.2 of Attachment F-1. The primary references for exposure factors are standard default exposure factors presented in USEPA guidance (USEPA 1991; 1997; 2000; 2002; 2004). A PEF (from exposed sediment at the AOIs) was calculated for use in intake calculations for potential current and future kayakers/boaters and waders/sunbathers (Table 4.2 Supplement of Attachment F-1). The PEF was calculated using Equation 4-5 and Exhibit D-2 of the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA 2002). Climate Zone 6 (based on Atlanta, Georgia) and a 1.7-acre areal extent of sediment contamination (based on the approximate area of the four AOIs combined) were used in the site-specific PEF calculations. Additionally, the average annual wind speed was obtained from the National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC) for a monitoring station (Greenville-Spartanburg, South Carolina) near the site (NCDC 2011).

A site-specific sediment exposure frequency was developed for kayakers/boaters based on the average number of days per year when the surface water within the project reach of OU2 in Twelvemile Creek is of sufficient depth (at least 1 foot) for kayaking and boating. Water depths in Twelvemile Creek were established based on channel flow plots generated by USACE for water flow rates of 100, 200, 300, and 500 cubic feet per second (ft^3/s) and the flow-duration curve based on the mean daily discharge at the U.S. Geological Survey Liberty Bridge gauging station. The 100- and 200-ft^3/s flow plots indicated areas containing less than 1 foot of water, while the 300- and 500-ft^3/s flow plots indicated water depths of 1 foot or more within the project reach of OU2. Considering 300 ft^3/s as the minimum flow for kayaking/boating, the flow duration curve indicates that the percentage of water flows equaling or exceeding 300 ft^3/s is about 9 percent, equating to approximately 33 days per year (Attachment F-6).

A site-specific sediment exposure frequency was calculated for sunbathers/waders based on the assumption that a person would be exposed every weekend (2 days per week) during the months of April through October (months with a mean maximum temperature greater than 70 degrees Fahrenheit [NCDC 2010]).

SECTION 4

Toxicity Assessment

The toxicity assessment describes the relationship between the magnitude of exposure to a constituent and the possible severity of adverse effects, and weighs the quality of available toxicological evidence. The assessment provides, where possible, a numerical estimate of the increased likelihood and/or severity of adverse effects associated with constituent exposure (USEPA 1989).

The toxicity assessment identifies the toxicity values for the COPC ("total PCBs") used to estimate potential health effects. Health effects are divided into two broad groups: noncarcinogenic and carcinogenic. This division of classification is used because health risks are calculated quite differently for carcinogenic and noncarcinogenic effects, and separate toxicity values are often available for carcinogenic and noncarcinogenic effects of a specific constituent. The oral and inhalation toxicity values used in the HHRA were obtained from USEPA's standard hierarchy of toxicity value sources (USEPA 2003). The carcinogenic and chronic noncarcinogenic toxicity values were obtained from USEPA's Integrated Risk Information System (IRIS; USEPA 2012b).

4.1 Noncarcinogenic Toxicity Values

Noncarcinogenic toxicity values (oral reference doses [RfDs]) were used in estimating potential adverse health effects associated with exposure to "total PCBs." The oral RfD for Aroclor-1254 was used to quantify potential noncarcinogenic hazards for "total PCBs" in the HHRA. As previously discussed, PCBs adsorbed to sediment tend to be of high chlorine content and persistence (USEPA 1996); therefore, it is appropriate to use the oral RfD for Aroclor-1254 to quantify potential noncarcinogenic hazards for "total PCBs." An inhalation reference concentration (RfC) is not available for "total PCBs." Therefore, noncarcinogenic effects associated with the inhalation route of exposure could not be quantified in the HHRA. Chronic toxicity data for potential noncarcinogenic effects of "total PCBs" are provided in Tables 5.1 and 5.2 of Attachment F-1.

4.2 Carcinogenic Toxicity Values

Carcinogenic toxicity values (cancer slope factors [CSFs] and inhalation unit risks [IURs]) were used in evaluating potential carcinogenic effects associated with exposure to "total PCBs." PCBs have a USEPA weight of evidence (WOE) classification of B2 (that is, probable human carcinogen based on sufficient evidence of carcinogenicity in animals) based on a 1996 study that found liver tumors in female rats exposed to Aroclors 1260, 1254, 1242, and 1016, and in male rats exposed to 1260 (USEPA 2012b). CSFs and IURs were used to estimate upper-bound lifetime statistical probabilities of a hypothetical individual developing cancer as a result of exposure to "total PCBs." The oral CSF and IUR for high-risk PCBs were used to quantify potential carcinogenic risks for "total PCBs" in the HHRA. Toxicity data for potential carcinogenic effects of "total PCBs" are provided in Tables 6.1 and 6.2 of Attachment F-1.

4.3 Derivation of Dermal Toxicity Values

The oral RfD and CSF for "total PCBs" were used as the dermal RfD and CSF, without adjustment, because the gastrointestinal absorption factor is greater than 50 percent (USEPA 2004). The dermal RfD is included in Table 5.1 of Attachment F-1, and the dermal CSF is provided in Table 6.1 of Attachment F-1.

SECTION 5

Risk Characterization

Potential human health risks are discussed separately for carcinogenic and noncarcinogenic endpoints due to the different relevant exposure durations and methods used to estimate risk. USEPA Region 4 considers an acceptable site ELCR range to be within 1 to 100 in a million (1×10^{-6} to 1×10^{-4}) (USEPA 2000). Generally, remedial actions are not warranted for site media with an ELCR of 1×10^{-4} or below, or a hazard index (HI) of 1 or below, although it may be warranted if other site-specific information suggests to risk managers that action is appropriate.

5.1 Approach for Potential Noncarcinogenic Effects

The HHRA evaluated the potential for noncarcinogenic effects by comparing exposure intakes of "total PCBs" with the oral and dermal RfDs. In USEPA methodology, the ratio of exposure to toxicity is referred to as an HQ. The HQ assumes that there is a level of exposure below which it is unlikely for even sensitive populations to experience adverse health effects. If the exposure level exceeds this threshold, there is the potential for noncancer health effects to occur. The HQ is calculated as follows:

$$HQ = \frac{I}{RfD}$$

where:

HQ = Hazard quotient (unitless)
I = Intake level (milligram per kilogram day [mg/kg-day])
RfD = Reference dose (mg/kg-day)

To assess the potential for noncarcinogenic health effects posed by exposure to multiple exposure routes, an HI approach was used (USEPA 1989). The HI is equal to the sum of the HQs and was calculated as follows:

$$HI = \frac{I_o}{RfD_o} + \frac{I_d}{RfD_d}$$

where:

HI = Hazard index (unitless)
I_o = Intake level for oral route (mg/kg-day)
RfD_o = Oral reference dose (mg/kg-day)
I_d = Intake level for dermal route (mg/kg-day)
RfD_d = Dermal reference dose (mg/kg-day)

If an HI exceeds 1, there is a potential for adverse noncarcinogenic effects.

5.2 Approach for Potential Carcinogenic Effects

The potential for carcinogenic effects due to exposure to site media was evaluated by estimating the ELCR. The ELCR is the incremental increase in the probability of developing cancer during one's lifetime (as a result of exposure to site sediment) above the probability of developing cancer from nonsite exposures.

Potential ELCRs associated with exposure to "total PCBs" were calculated using the CSF and chemical intake for oral and dermal contact exposures, and IURs and exposure concentrations (ECs) for inhalation exposures. The linear low-dose equation was used to estimate the incremental probability of an individual developing cancer over a lifetime as a result of exposure to "total PCBs." Estimated ELCRs were calculated by multiplying the intake by the CSF or EC by the IUR:

$$ELCR = I \times CSF \qquad \text{or} \qquad ELCR = EC \times IUR$$

where:

ELCR = Excess lifetime cancer risk (unitless)
I = Intake level (mg/kg-day)
CSF = Cancer slope factor $(mg/kg\text{-}day)^{-1}$
EC = Exposure concentration [microgram per cubic meter ($\mu g/m^3$)]
IUR = Inhalation unit risk $(\mu g/m^3)^{-1}$

The theoretical probability of developing cancer as a consequence of exposure to two or more exposure pathways was calculated using the following equation:

$$Total\ \ ELCR = \left(I_o \times CSF_o\right) + \left(I_d \times CSF_d\right) + \left(EC \times IUR\right)$$

where:

ELCR = Excess lifetime cancer risk (unitless)
I_o = Intake level for oral route (mg/kg-day)
CSF_o = Oral cancer slope factor $(mg/kg\text{-}day)^{-1}$
I_d = Intake level for dermal route (mg/kg-day)
CSF_d= Dermal cancer slope factor $(mg/kg\text{-}day)^{-1}$
EC = Exposure concentration ($\mu g/m^3$)
IUR = Inhalation unit risk $(\mu g/m^3)^{-1}$

5.3 Summary of Risk Estimates

Potential current/future exposures to exposed and submerged sediment at Exposure Unit 1 and Exposure Unit 2 were quantified for potential kayakers/boaters and waders/sunbathers, respectively. The estimated ELCRs and HIs for potential exposures by the potential receptor groups are provided below and summarized in Table 1:

- **Kayakers/Boaters (Adult and Adolescent)—Exposure Unit 1**
  - Adult: 4×10^{-8} ELCR and HI less than 1 (Table 7.1, summarized in Table 9.1 of Attachment F-1)
  - Adolescent: 2×10^{-8} ELCR and HI less than 1 (Table 7.2, summarized in Table 9.2 of Attachment F-1)
- **Waders/Sunbathers (Adult and Child)—Exposure Unit 2**
  - Adult: 2×10^{-7} ELCR and HI less than 1 (Table 7.3, summarized in Table 9.3 of Attachment F-1)
  - Child: 1×10^{-7} ELCR and HI less than 1 (Table 7.4, summarized in Table 9.4 of Attachment F-1)

The estimated ELCRs were lower than the USEPA's acceptable risk range of 1×10^{-6} to 1×10^{-4}, and the HIs were less than USEPA's target HI of 1. Therefore, ELCR and noncancer hazard estimates are within USEPA acceptable levels and no chemicals of concern (COCs) were identified in sediment within the project reach at OU2 based on the potential kayaker/boater and wader/sunbather scenarios.

TABLE 1
Risk Summary Table
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Exposure Point	Receptor	Exposure Route	ELCR	HQ/HI
Sediment Exposure Unit 1	Kayaker/Boater (Adult)	Ingestion	2E-08	0.001
		Dermal	2E-08	0.001
		Inhalation	4E-13	NA
		Total	**4E-08**	**0.003**
	Kayaker/Boater (Adolescent)	Ingestion	1E-08	0.002
		Dermal	9E-09	0.001
		Inhalation	2E-13	NA
		Total	**2E-08**	**0.004**
Sediment Exposure Unit 2	Wader/Sunbather (Adult)	Ingestion	4E-08	0.003
		Dermal	1E-07	0.01
		Inhalation	8E-13	NA
		Total	**2E-07**	**0.01**
	Wader/Sunbather (Child)	Ingestion	9E-08	0.03
		Dermal	6E-08	0.02
		Inhalation	2E-13	NA
		Total	**1E-07**	**0.04**

Note:
Exposure Unit 1: Submerged sediment from the project reach and exposed sediment from four AOIs.
Exposure Unit 2: Submerged sediment within 100 feet of four AOIs and exposed sediment from four AOIs.
AOI = area of interest
ELCR = excess lifetime cancer risk
HI = hazard index
HQ = hazard quotient

5.4 Uncertainty Analysis

The assumptions used in the HHRA have inherent uncertainty. While it is theoretically possible that this leads to underestimates of potential risk, the use of numerous upper-bound assumptions most likely results in conservative estimates of potential risk. A receptor group's potential exposure and subsequent potential risk are influenced by the exposure scenario and dose/response and vary on a case-by-case basis. Specific uncertainties associated with the HHRA for the project reach of OU2 are discussed below.

5.4.1 Data Evaluation

The purpose of data evaluation is to determine which constituents, if any, are present at OU2 at concentrations requiring evaluation in the HHRA. Uncertainty with respect to data evaluation can arise from many sources, such as the quality of data used to characterize the site and the process used to select COPCs in the HHRA.

Both discrete and incremental sediment samples were evaluated in the HHRA. The concentration of an incremental sample represents the average concentration of the sediment for a specific area. Therefore, incremental samples

are likely to provide a better representation of average values that relate to chronic exposures for kayakers/boaters and waders/sunbathers. Using upper-bound estimates from discrete samples in the HHRA likely overestimates potential exposures and risks for kayakers/boaters and waders/sunbathers at the project reach of OU2 because these receptors are assumed to be potentially exposed to the upper-bound concentration throughout their entire exposure duration.

5.4.2 Exposure Assessment

Potential exposures to surface water were not evaluated in the HHRA. If PCBs are present in surface water, they are expected to adsorb strongly to sediment particulates rather than dissolve in the water column. Potential exposures to PCBs in surface water would occur through suspended sediment; therefore, potential exposures and risks were only quantified for site sediment. The estimated exposures and risks for sediment are likely protective of potential receptors who contact both surface water and sediment at OU2.

The 95th percent UCL concentrations were selected as the EPCs for "total PCBs" in sediment at Exposure Unit 1 and Exposure Unit 2. In general, the smaller the sample size and number of detected concentrations of a chemical, the less reliable the calculated UCL becomes. Although only 9 sediment samples were available to calculate a 95 percent UCL concentration for Exposure Unit 2, the potential impacts on the overall HHRA conclusions are expected to be minimal because of the relatively low maximum-detected PCB concentrations in sediment in the project reach of OU2.

An additional evaluation was conducted to address uncertainty in the EPCs that potential receptors may contact over time within the project reach of OU2. The maximum detected concentrations for "total PCBs" in sediment at Exposure Unit 1 and Exposure Unit 2 were used as the EPCs in a separate set of risk calculations to estimate potential ELCRs and HIs for kayakers/boaters and waders/sunbathers potentially exposed to the maximum detected concentration over their entire exposure duration. The calculations are provided in Attachment F-7, and the following are the estimated ELCRs and HIs:

- **Kayakers/Boaters (Adult and Adolescent)—Exposure Unit 1**
  - Adult: 1×10^{-7} ELCR and HI less than 1 (Table 7.1, summarized in Table 9.1 of Attachment F-7)
  - Adolescent: 5×10^{-8} ELCR and HI less than 1 (Table 7.2, summarized in Table 9.2 of Attachment F-7)
- **Waders/Sunbathers (Adult and Child)—Exposure Unit 2**
  - Adult: 3×10^{-7} ELCR and HI less than 1 (Table 7.3, summarized in Table 9.3 of Attachment F-7)
  - Child: 2×10^{-7} ELCR and HI less than 1 (Table 7.4, summarized in Table 9.4 of Attachment F-7)

The estimated ELCRs were less than the USEPA's acceptable risk range of 1×10^{-6} to 1×10^{-4}, and the estimated HIs were less than USEPA's target HI of 1. Therefore, use of the maximum detected concentrations as EPCs in the risk estimates does not change the overall risk conclusions in the HHRA: no COCs were identified in sediment within the project reach at OU2 based on the potential kayaker/boater and wader/sunbather exposure scenarios and maximum detected concentrations.

5.4.3 Toxicity Assessment

Noncancer inhalation toxicity values were not available for "total PCBs;" therefore, noncarcinogenic hazards were not quantified for the inhalation exposure route for "total PCBs." This leads to an underestimation of noncancer hazards, although the extent cannot be determined. However, the potential impacts on the overall HHRA conclusions are expected to be minimal because of the relatively low maximum-detected PCB concentrations in sediment in the project reach of OU2 and the relatively low significance of the inhalation exposure pathway for sediment exposures scenarios.

5.4.4 Risk Characterization

Generally, the goal of an HHRA is to evaluate upper-bound, but reasonable, exposure scenarios. Such an upper-bound estimate can be derived in several ways, depending on how conservative one wants the final estimate to be. Risk assessments often combine several upper-bound assumptions to estimate potential risks. Most of the assumptions about exposure and toxicity used in this HHRA are representative of statistical upper-bounds for each

parameter. The result of combining several upper-bound assumptions is that the final estimates of potential exposure and risk/hazard are conservative.

SECTION 6

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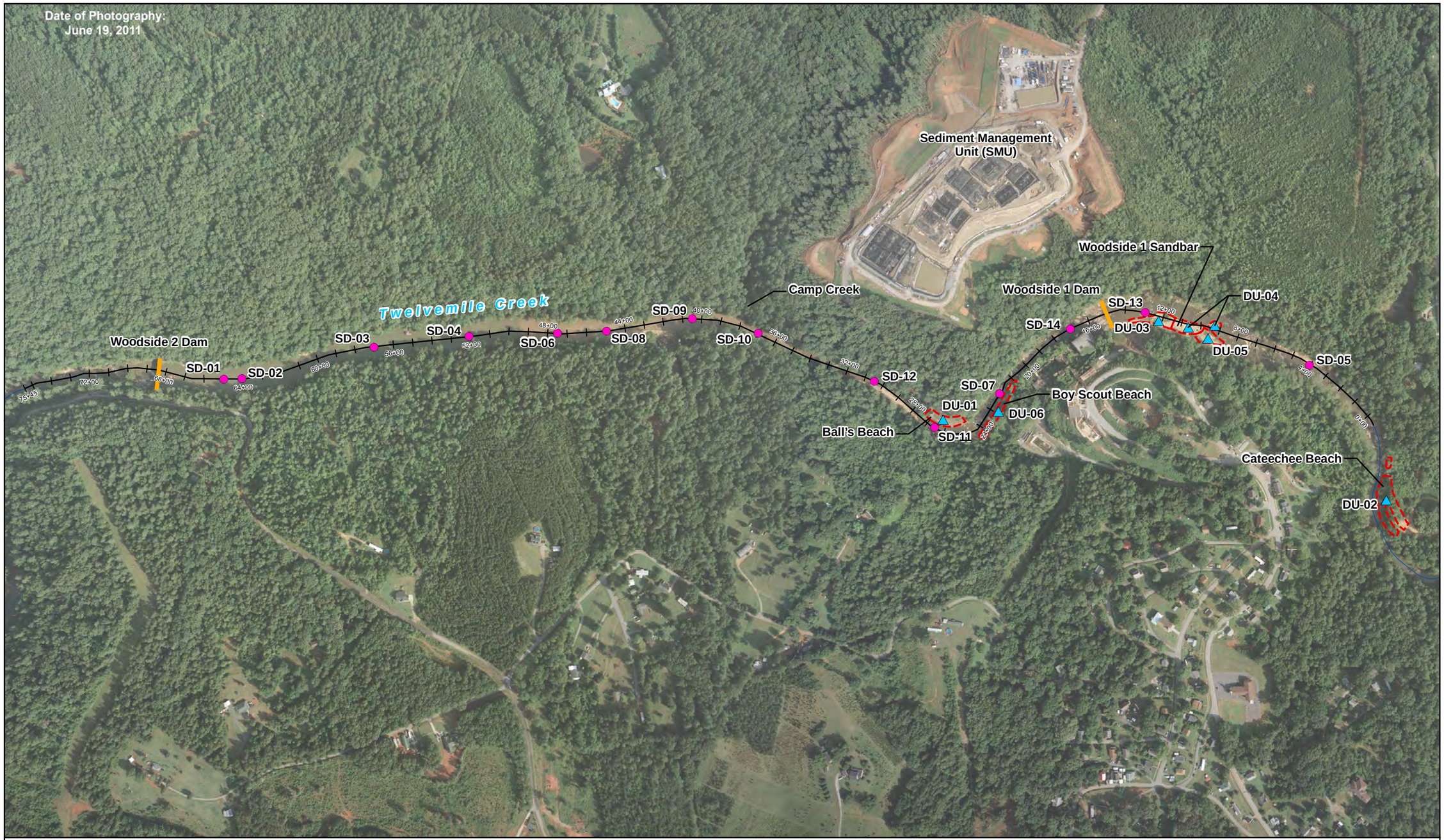
Figure



0 250 500 Feet

LEGEND

- Approximate Creek Centerline and Stationing
- Former Dam
- Approximate Extent of Areas of Interest
- Sediment Sample Location by Incremental Sampling
- Submerged Sediment Sample Location

Note:
1. Sample locations are approximate and were determined in the field by noting station location stakes. All locations are within +/-10 feet of the stated stake location. Due to the high sidewalls of the creek the handheld GPS unit was unable to receive signal to provide location information.

APPENDIX F – FIGURE 1
Locations of Areas of Interest, Incremental Samples, and Submerged Sediment Samples
Human Health Risk Assessment
Operable Unit 2 of the Twelvemile Creek Site
Pickens County, South Carolina

CH2MHILL

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Attachment F-1
RAGS Part D Tables

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe	Medium	Exposure Medium	Exposure Point (1)	Receptor Population	Receptor Age (2)	Exposure Route	Onsite/ Offsite	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Sediment	Sediment	Sediment Exposure Unit 1	Kayaker/ Boater	Adult and Adolescent	Dermal, Ingestion, Inhalation	Onsite	Quant	Kayakers and boaters may contact sediment during occasional recreational activities at the site. The site conditions are not conducive for swimming due to shallow water and bedrock. If kayakers or boaters encounter a shallow zone in the creek, they would likely need to pick up their kayak/boat and walk some distance in the creek before placing it back into the creek. Kayakers or boaters may also go to the shorelines to rest/picnic.
			Sediment Exposure Unit 2	Wader/ Sunbather	Adult and Child	Dermal, Ingestion, Inhalation	Onsite	Quant	Waders and sunbathers may contact sediment during occasional recreational activities at the site. The site conditions are not conducive for swimming due to shallow water and bedrock.

Notes:

(1) The exposure units are defined as follows:

Exposure Unit 1: Submerged sediment samples throughout the project reach and exposed sediment samples from four AOIs.

Exposure Unit 2: Submerged sediment samples within 100 feet of four AOIs and exposed sediment samples from four AOIs.

(2) The age group for a child is 0 to 6 years old and the age group for an adolescent is 6 to 16 years old.

AOI = area of interest

Quant = quantitative

TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Kayaker/Boater)

Exposure Point	CAS Number	Chemical	Minimum Concentration	Qualifier	Maximum Concentration	Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value	Screening Toxicity Value (2)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Selection or Deletion (3)
Sediment Exposure Unit 1	12672-29-6	PCB-1248	0.023	J	0.33	J	mg/kg	SD03	12 / 20	3.20E-02 - 4.60E-02	3.30E-01	NA	2.2E-01	ca	NA	NA	Yes	ASL (5)
	11097-69-1	PCB-1254	0.0065	J	0.21	J	mg/kg	SD03	17 / 20	3.20E-02 - 4.60E-02	2.10E-01	NA	1.1E-01	nc	NA	NA	Yes	ASL (5)
	NA	Total PCBs (4)	0.0065		0.54		mg/kg	SD03	17 / 20	-	5.40E-01	NA	1.1E-01	nc	NA	NA	Yes	ASL

(1) Maximum detected concentration is used for screening.

(2) Regional Screening Levels for Residential Soil (May 2012). Concentrations based on non-carcinogenic health effects are adjusted using HQ=0.1.
The SL for Aroclor-1254 is used as the SL for total PCBs.

(3) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

(4) Total PCBs represent the sum of the detected Aroclor concentrations in each sample.

(5) Exposures and risks will be quantified using Total PCBs (refer to the text for additional details).

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

ca = Carcinogenic
nc = Noncarcinogenic
J = Compound was detected below the reporting limit in the sample
mg/kg = milligram per kilogram
NA = Not available
SL = Screening Level
HQ = Hazard Quotient

TABLE 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Wader/Sunbather)

Exposure Point	CAS Number	Chemical	Minimum Concentration Qualifier	Maximum Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value	Screening Toxicity Value (2)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for Selection or Deletion (3)
Sediment Exposure Unit 2	12672-29-6	PCB-1248	0.023 J	0.24	mg/kg	SD07	8 / 9	3.20E-02 - 4.40E-02	2.40E-01	NA	2.2E-01	ca	NA	NA	Yes	ASL (5)
	11097-69-1	PCB-1254	0.026 J	0.16 J	mg/kg	SD07	8 / 9	3.20E-02 - 4.40E-02	1.60E-01	NA	1.1E-01	nc	NA	NA	Yes	ASL (5)
	NA	Total PCBs (4)	0.049	0.4	mg/kg	SD07	8 / 9	-	4.00E-01	NA	1.1E-01	nc	NA	NA	Yes	ASL

Notes:

(1) Maximum detected concentration is used for screening.

(2) Regional Screening Levels for Residential Soil (May 2012). Concentrations based on noncarcinogenic health effects are adjusted using HQ=0.1.
The SL for Aroclor-1254 is used as the SL for total PCBs.

(3) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Below Screening Level (BSL)

(4) Total PCBs represent the sum of the detected Aroclor concentrations in each sample.

(5) Exposures and risks will be quantified using total PCBs (refer to the text for additional details).

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
PCB = polychlorinated biphenyl
ca = Carcinogenic
nc = Noncarcinogenic
J = Compound was detected below the reporting limit in the sample
mg/kg = milligram per kilogram
NA = Not available
SL = Screening Level
HQ = Hazard Quotient

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Kayaker/Boater)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (NR/T/G)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Sediment Exposure Unit 1	Total PCBs	mg/kg	1.3E-01	2.2E-01 G	5.4E-01	2.2E-01	mg/kg	95% Approximate Gamma UCL	1

ProUCL, Version 4.1.01 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate exposure point concentration, following recommendations based on distribution and standard deviation in User's Guide (USEPA. July 2011. ProUCL, Version 4.1.01. Prepared by Lockheed Martin Environmental Services).

(1) Anderson-Darling and/or Kolmogorov-Smirnov Tests indicate data are gamma distributed.

mg/kg= milligram/kilogram
NR = Normal distribution
T = Log-normal distribution
G = Gamma distribution

TABLE 3.1.RME Supplement
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Kayaker/Boater)

Exposure Point	Chemical of Potential Concern	Exposure Point Concentration in Sediment		Exposure Point Concentration in Ambient Air	
		Value (1)	Units	Value (2)	Units
Ambient Air Exposure Unit 1	Total PCBs	2.2E-01	mg/kg	1.39E-10	mg/m^3

(1) Selection of exposure point concentrations presented on Table 3.1.RME.

(2) Ambient air exposure point concentration calculated using a Particulate Emission Factor (PEF) of 1.59×10^9 m^3/kg as shown below; derivation of PEF is presented on Table 4.2 RME Supplement.

Concentration in ambient air (mg/m^3) = Concentration in sediment (mg/kg) x [1/PEF (m^3/kg)]

mg/kg= milligram/kilogram
mg/m^3 = milligram/cubic meter

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Wader/Sunbather)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (NR/T/G)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Sediment Exposure Unit 2	Total PCBs	mg/kg	1.5E-01	2.6E-01 G	4.00E-01	2.6E-01	mg/kg	95% Approximate Gamma UCL	1

ProUCL, Version 4.1.01 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate exposure point concentration, following recommendations based on distribution and standard deviation in User's Guide (USEPA. July 2011. ProUCL, Version 4.1.01. Prepared by Lockheed Martin Environmental Services).

(1) Anderson-Darling and/or Kolmogorov-Smirnov Tests indicate data are gamma distributed.

mg/kg= milligram/kilogram
NR = Normal distribution
T = Log-normal distribution
G = Gamma distribution

TABLE 3.2.RME Supplement
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Wader/Sunbather)

Exposure Point	Chemical of Potential Concern	Exposure Point Concentration in Sediment		Exposure Point Concentration in Ambient Air	
		Value (1)	Units	Value (2)	Units
Ambient Air Exposure Unit 2	Total PCBs	2.6E-01	mg/kg	1.64E-10	mg/m^3

(1) Selection of exposure point concentrations presented on Table 3.2.RME.

(2) Ambient air exposure point concentration calculated using a Particulate Emission Factor (PEF) of 1.59×10^9 m^3/kg as shown below; derivation of PEF is presented on Table 4.2 RME Supplement.

Concentration in ambient air (mg/m^3) = Concentration in sediment (mg/kg) x [1/PEF (m^3/kg)]

mg/kg = milligram/kilogram
mg/m^3 = milligram/cubic meter

TABLE 4.1 RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point (1)	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Kayaker/Boater	Adult	Sediment Exposure Unit 1	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	Chronic Daily Intake (CDI) (mg/kg-day) = C_{sed} x IR-Sed x EF x ED x CF x 1/BW x 1/AT
				IR-Sed	Ingestion Rate of Sediment	100	mg/day	USEPA, 2002 (3)	
				EF	Exposure Frequency	33	days/year	(4)	
				ED	Exposure Duration	24	years	USEPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	USEPA, 2002	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
		Adolescent	Sediment Exposure Unit 1	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	CDI (mg/kg-day) = C_{sed} x IR-Sed x EF x ED x CF x 1/BW x 1/AT
				IR-Sed	Ingestion Rate of Sediment	100	mg/day	USEPA, 2002 (3)	
				EF	Exposure Frequency	33	days/year	(4)	
				ED	Exposure Duration	10	years	USEPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	45	kg	USEPA, 2000	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
	Wader/Sunbather	Adult	Sediment Exposure Unit 2	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	CDI (mg/kg-day) = C_{sed} x IR-Sed x EF x ED x CF x 1/BW x 1/AT
				IR-Sed	Ingestion Rate of Sediment	100	mg/day	USEPA, 2002 (3)	
				EF	Exposure Frequency	56	days/year	(7)	
				ED	Exposure Duration	24	years	USEPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	USEPA, 2002	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	

TABLE 4.1 RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point (1)	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion (cont.)	Wader/Sunbather (cont.)	Child	Sediment Exposure Unit 2	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	CDI (mg/kg-day) =
				IR-Sed	Ingestion Rate of Sediment	200	mg/day	USEPA, 2002 (3)	C_{sed} x IR-Sed x EF x ED x CF x 1/BW x 1/AT
				EF	Exposure Frequency	56	days/year	(7)	
				ED	Exposure Duration	6	years	USEPA, 1991	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	USEPA, 2002	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
Dermal	Kayaker/Boater	Adult	Sediment Exposure Unit 1	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,600	cm^2	USEPA, 1997 (8)	C_{sed} x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	USEPA, 2004 (9)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	0.14	--	USEPA, 2004	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	33	days/year	(4)	
				ED	Exposure Duration	24	years	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 2002	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
		Adolescent	Sediment Exposure Unit 1	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,400	cm^2	USEPA, 2004 (8)	C_{sed} x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	USEPA, 2004 (9)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	0.14	--	USEPA, 2004	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	33	days/year	(4)	
				ED	Exposure Duration	10	years	USEPA, 1991	
				BW	Body Weight	45	kg	USEPA, 2000	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	

TABLE 4.1 RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point (1)	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (cont.)	Wader/Sunbather	Adult	Sediment Exposure Unit 2	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	12,000	cm^2	USEPA, 1997 (10)	C_{sed} x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	USEPA, 2004 (9)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	0.14	--	USEPA, 2004	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	56	days/year	(7)	
				ED	Exposure Duration	24	years	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 2002	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
		Child	Sediment Exposure Unit 2	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,300	cm^2	USEPA, 2004 (10)	C_{sed} x SA x SSAF x DABS x CF x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	USEPA, 2004 (9)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	0.14	--	USEPA, 2004	
				CF	Conversion Factor	0.000001	kg/mg	- -	
				EF	Exposure Frequency	56	days/year	(7)	
				ED	Exposure Duration	6	years	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 2002	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	

Notes:

(1) The exposure units are defined as follows:

Exposure Unit 1: Samples collected from submerged sediments throughout the project reach and samples collected from sediments at the four AOIs.

Exposure Unit 2: Samples collected from submerged sediments within 100 feet of the four AOIs and samples collected from sediments at the four AOIs.

(2) The chemical concentrations in sediment to be used in the intake calculations are presented in the RAGS Part D Table 3 series.

(3) Assumed sediment ingestion rate is equal to the incidental soil ingestion rate because some sediments are not covered by water (USEPA, 2000).

(4) Based on days per year that the water throughout the reach is of sufficient depth (at least one foot) for kayaking and boating, per channel flow plots generated by USACE in April 2012.

(5) Calculated as the product of ED (years) x 365 days/year.

(6) Calculated as the product of 70 years assumed human lifetime (USEPA, 1989) x 365 days/year.

(7) Professional judgment assuming each weekend during the months of April through October (months with a mean maximum temperature greater than 70°F [National Climatic Data Center, 2010]).

(8) SA includes lower legs and feet.

(9) Adherence factor for children playing in wet soil, based on the geometric mean (Exhibit C-3).

(10) SA includes feet, legs, hands, arms, and head.

TABLE 4.1 RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point (1)	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

Sources:

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/P-95/002Fa.

USEPA, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment Bulletins. USEPA Region 4, originally published November 1995, Website version last updated May 2000 (currently under revision).

[Online]. Available: http://www.USEPA.gov/region4/superfund/programs/riskassess/healtbul.html.

USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

USEPA, 2004: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). USEPA/540/R/99/005. July 2004.

NCDC, 2010. Monthly Surface Data for 2010 from Monitoring Station "Clemson Univ." [Online]. Available: http://www.ncdc.noaa.gov/oa/climate/surfaceinventories.html.

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Ambient Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point (1)	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Kayaker/Boater	Adult	Ambient Air Exposure Unit 1	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	Exposure Concentration (EC) (mg/m^3) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	USEPA, 2002	CA x ET x EF x ED x CF x 1/AT
				PEF	Particulate Emission Factor	1.59E+09	m^3/kg	see Table 4.2.RME Supplement	CA (mg/m^3) = C_{sed} x 1/PEF
				ET	Exposure Time	4	hr/day	(3)	
				EF	Exposure Frequency	33	days/year	(4)	
				ED	Exposure Duration	24	years	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
				CF	Conversion Factor 1	1/24	day/hr	- -	
		Adolescent	Ambient Air Exposure Unit 1	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	EC (mg/m^3) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	USEPA, 2002	CA x ET x EF x ED x CF x 1/AT
				PEF	Particulate Emission Factor	1.59E+09	m^3/kg	see Table 4.2.RME Supplement	CA (mg/m^3) = C_{sed} x 1/PEF
				ET	Exposure Time	4	hr/day	(3)	
				EF	Exposure Frequency	33	days/year	(4)	
				ED	Exposure Duration	10	years	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	3,650	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
				CF	Conversion Factor 1	1/24	day/hr	- -	

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Ambient Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point (1)	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation (cont.)	Wader/Sunbather	Adult	Ambient Air Exposure Unit 2	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	EC (mg/m^3) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	USEPA, 2002	CA x ET x EF x ED x CF x 1/AT
				PEF	Particulate Emission Factor	1.59E+09	m^3/kg	see Table 4.2.RME Supplement	CA (mg/m^3) = C_{sed} x 1/PEF
				ET	Exposure Time	4	hr/day	(3)	
				EF	Exposure Frequency	56	days/year	(7)	
				ED	Exposure Duration	24	years	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
				CF	Conversion Factor 1	1/24	day/hr	- -	
		Child	Ambient Air Exposure Unit 2	C_{sed}	Chemical Concentration in Sediment	(2)	mg/kg	(2)	EC (mg/m^3) =
				CA	Chemical Concentration in Air	Calculated	mg/m^3	USEPA, 2002	CA x ET x EF x ED x CF x 1/AT
				PEF	Particulate Emission Factor	1.59E+09	m^3/kg	see Table 4.2.RME Supplement	CA (mg/m^3) = C_{sed} x 1/PEF
				ET	Exposure Time	4	hr/day	(3)	
				EF	Exposure Frequency	56	days/year	(7)	
				ED	Exposure Duration	6	years	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	(6)	
				CF	Conversion Factor 1	1/24	day/hr	- -	

Notes:
(1) The exposure units are defined as follows:
Exposure Unit 1: Samples collected from submerged sediments throughout the project reach and samples collected from sediments at the four AOIs.
Exposure Unit 2: Samples collected from submerged sediments within 100 feet of the four AOIs and samples collected from sediments at the four AOIs.
(2) The chemical concentrations in sediment are presented in the RAGS Part D Table 3 series.
(3) Based on best professional judgment.
(4) Based on days per year that the water throughout the reach is of sufficient depth (at least one foot) for kayaking and boating, per channel flow plots generated by USACE in April 2012.
(5) Calculated as the product of ED (years) x 365 days/year.
(6) Calculated as the product of 70 years assumed human lifetime (USEPA, 1989) x 365 days/year.
(7) Professional judgment assuming each weekend during the months of April through October (months with a mean maximum temperature greater than 70°F [National Climatic Data Center, 2010]).

Sources:
USEPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.
NCDC, 2010. Monthly Surface Data for 2010 from Monitoring Station "Clemson Univ." [Online]. Available: http://www.ncdc.noaa.gov/oa/climate/surfaceinventories.html.

TABLE 4.2.RME Supplement
Particulate Emission Factor
OU2, Twelvemile Creek Site, Pickens County, South Carolina

PEF Equations:

$$Q/C_{wind} = A \times \exp\left[\frac{(\ln A_{site} - B)^2}{C}\right]$$ **Exhibit D-2 (USEPA, 2002)**

$$PEF = Q/C_{wind} \times \frac{3{,}600 \text{sec/hr}}{0.036 \times (1-V) \times \left(U_m/U_t\right)^3 \times F(x)}$$ **Equation 4-5 (USEPA, 2002)**

PEF and Box Model Input Parameters

Parameter	Definition	Value	Units	Source
Q/C_{wind}	Inverse ratio of the geometric mean air concentration to the emission flux at the center of a square source	**65**	m	calculated
A	Constant for Zone 6 (Atlanta, GA)	14.835	unitless	Exhibit D-2 (USEPA, 2002)
B	Constant for Zone 6 (Atlanta, GA)	17.926	unitless	Exhibit D-2 (USEPA, 2002)
C	Constant for Zone 6 (Atlanta, GA)	204.152	unitless	Exhibit D-2 (USEPA, 2002)
A_{site}	Areal extent of site contamination	1.7	acres	approximate extent of areas of interest
PEF	particulate emission factor	**1.59E+09**	m^3/kg	calculated
V	fraction of vegetative cover	0	unitless	site-specific [a]
Um	mean annual windspeed	3.13	m/s	National Climatic Data Center [b]
Ut	equivalent threshold value of windspeed at 7 m	11.32	m/s	Default (Eqn. 4-5)
F(x)	function dependent on Um/Ut derived using Cowherd, et al. (1985)	0.194	unitless	Default (Eqn. 4-5)

Note:

[a] Assumes non-submerged sediment available for potential contact by receptors is completely exposed (that is, no vegetative cover).

[b] Average annual windspeed recorded at station, Greenville-Spartanburg AP, SC. Available online: http://www1.ncdc.noaa.gov/pub/data/ccd-data/wndspd11.txt.

Source:

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, USEPA Office of Solid Waste and Emergency Response. OSWER 9355.4-24. December.

TABLE 5.1

NON-CANCER TOXICITY DATA—ORAL/DERMAL

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Total PCBs (3)	Chronic	2.0E-05	mg/kg-day	80 - 96%	2.0E-05	mg/kg-day	Fingernails, Eyes	300 / 1	IRIS	07/01/2012

Note:

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50 percent.

Definitions: IRIS = Integrated Risk Information System

(2) Adjusted based on RAGS Part E.

(3) Aroclor 1254 is used to represent Total PCBs. The total PCBs in each sample were calculated by summing the Aroclor concentrations.

TABLE 5.2

NON-CANCER TOXICITY DATA—INHALATION

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Total PCBs (1)	Chronic	NA	NA	NA	NA	NA	NA

Note:

(1) The total PCBs in each sample were calculated by summing the Aroclor concentrations.

NA = Not Available

TABLE 6.1
CANCER TOXICITY DATA—ORAL/DERMAL
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal (2)		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Total PCBs (3)	2.0E+00	$(mg/kg\text{-}day)^{-1}$	80 - 96%	2.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (RSL)	05/2012

Note:

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral slope factor should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50 percent.

(2) Adjusted based on RAGS Part E.

(3) High-risk PCBs are used to represent total PCBs. The total PCBs in each sample were calculated by summing the Aroclor concentrations.

Definitions:
IRIS = Integrated Risk Information System
RSL = As cited in USEPA Regional Screening Level Table

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Chemical of Potential Concern	Unit Risk		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Total PCBs (1)	5.7E-04	$(ug/m^3)^{-1}$	B2	IRIS (RSL)	05/2012

Note:

(1) High Risk PCBs are used to represent total PCBs. The total PCBs in each sample were calculated by summing the Aroclor concentrations.

Definitions: IRIS = Integrated Risk Information System

RSL = As cited in USEPA Regional Screening Level Table

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Kayaker/Boater
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
					Value	Units	Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment Exposure Unit 1	Ingestion	Total PCBs	2.2E-01	mg/kg	9.8E-09	mg/kg-day	2.0E+00	1/(mg/kg-day)	2E-08	2.9E-08	mg/kg-day	2.0E-05	mg/kg-day	0.001
			Exp. Route Total								2E-08					0.001
	Sediment	Sediment Exposure Unit 1	Dermal	Total PCBs	2.2E-01	mg/kg	9.9E-09	mg/kg-day	2.0E+00	1/(mg/kg-day)	2E-08	2.9E-08	mg/kg-day	2.0E-05	mg/kg-day	0.001
			Exp. Route Total								2E-08					0.001
		Exposure Point Total									4E-08					0.003
	Exposure Medium Total										4E-08					0.003
Sediment	Ambient Air	Ambient Air Exposure Unit 1	Inhalation	Total PCBs	1.4E-10	mg/m^3	7.2E-13	mg/m^3	5.7E-04	1/(µg/m3)	4E-13	2.1E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								4E-13					NA
		Exposure Point Total									4E-13					NA
	Exposure Medium Total										4E-13					NA
Sediment Total											4E-08					0.003
Receptor Total											4E-08					0.003

NA = Not applicable or not available

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Kayaker/Boater
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment Exposure Unit 1	Ingestion	Total PCBs	2.2E-01	mg/kg	6.4E-09	mg/kg-day	2.0E+00	1/(mg/kg-day)	1E-08	4.5E-08	mg/kg-day	2.0E-05	mg/kg-day	0.002
			Exp. Route Total								1E-08					0.002
Sediment	Sediment	Sediment Exposure Unit 1	Dermal	Total PCBs	2.2E-01	mg/kg	4.3E-09	mg/kg-day	2.0E+00	1/(mg/kg-day)	9E-09	3.0E-08	mg/kg-day	2.0E-05	mg/kg-day	0.001
			Exp. Route Total								9E-09					0.001
		Exposure Point Total									2E-08					0.004
	Exposure Medium Total										2E-08					0.004
Sediment	Ambient Air	Ambient Air Exposure Unit 1	Inhalation	Total PCBs	1.4E-10	mg/m^3	3.0E-13	mg/m^3	5.7E-04	1/(µg/m3)	2E-13	2.1E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								2E-13					NA
		Exposure Point Total									2E-13					NA
	Exposure Medium Total										2E-13					NA
Sediment Total											2E-08					0.004
Receptor Total											2E-08					0.004

NA = Not applicable or not available

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Wader/Sunbather
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment Exposure Unit 2	Ingestion	Total PCBs	2.6E-01	mg/kg	2.0E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	4E-08	5.7E-08	mg/kg-day	2.0E-05	mg/kg-day	0.003
			Exp. Route Total								4E-08					0.003
Sediment	Sediment	Sediment Exposure Unit 2	Dermal	Total PCBs	2.6E-01	mg/kg	6.6E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	1E-07	1.9E-07	mg/kg-day	2.0E-05	mg/kg-day	0.01
			Exp. Route Total								1E-07					0.01
		Exposure Point Total									2E-07					0.01
	Exposure Medium Total										2E-07					0.01
Sediment	Ambient Air	Ambient Air Exposure Unit 2	Inhalation	Total PCBs	1.6E-10	mg/m^3	1.4E-12	mg/m^3	5.7E-04	1/(µg/m3)	8E-13	4.2E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								8E-13					NA
		Exposure Point Total									8E-13					NA
	Exposure Medium Total										8E-13					NA
Sediment Total											2E-07					0.01
Receptor Total											2E-07					0.01

NA = Not applicable or not available

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Wader/Sunbather
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment Exposure Unit 2	Ingestion	Total PCBs	2.6E-01	mg/kg	4.6E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	9E-08	5.3E-07	mg/kg-day	2.0E-05	mg/kg-day	0.03
			Exp. Route Total								9E-08					0.03
Sediment	Sediment	Sediment Exposure Unit 2	Dermal	Total PCBs	2.6E-01	mg/kg	2.8E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	6E-08	3.2E-07	mg/kg-day	2.0E-05	mg/kg-day	0.02
			Exp. Route Total								6E-08					0.02
		Exposure Point Total									1E-07					0.04
	Exposure Medium Total										1E-07					0.04
Sediment	Ambient Air	Ambient Air Exposure Unit 2	Inhalation	Total PCBs	1.6E-10	mg/m^3	3.6E-13	mg/m^3	5.7E-04	1/(µg/m3)	2E-13	4.2E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								2E-13					NA
		Exposure Point Total									2E-13					NA
	Exposure Medium Total										2E-13					NA
Sediment Total											1E-07					0.04
Receptor Total											1E-07					0.04

NA = Not applicable or not available

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Kayaker/Boater
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment Exposure Unit 1	Total PCBs	2E-08	NA	2E-08	4E-08	Fingernails, Eyes	0.001	NA	0.001	0.003
		Exposure Point Total		2E-08	NA	2E-08	4E-08		0.001	NA	0.001	0.003
	Exposure Medium Total			2E-08	NA	2E-08	4E-08		0.001	NA	0.001	0.003
	Ambient Air	Ambient Air Exposure Unit 1	Total PCBs	NA	4E-13	NA	4E-13	NA	NA	NA	NA	NA
		Exposure Point Total		NA	4E-13	NA	4E-13		NA	NA	NA	NA
	Exposure Medium Total			NA	4E-13	NA	4E-13		NA	NA	NA	NA
Sediment Total				2E-08	4E-13	2E-08	4E-08		0.001	NA	0.001	0.003
Receptor Total				2E-08	4E-13	2E-08	4E-08		0.001	NA	0.001	0.003

NA = Not applicable or not available

Total Fingernails HI Across Media =	0.003
Total Eyes HI Across Media =	0.003

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Kayaker/Boater
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment Exposure Unit 1	Total PCBs	1E-08	NA	9E-09	2E-08	Fingernails, Eyes	0.002	NA	0.001	0.004
		Exposure Point Total		1E-08	NA	9E-09	2E-08		0.002	NA	0.001	0.004
	Exposure Medium Total			1E-08	NA	9E-09	2E-08		0.002	NA	0.001	0.004
	Ambient Air	Ambient Air Exposure Unit 1	Total PCBs	NA	2E-13	NA	2E-13	NA	NA	NA	NA	NA
		Exposure Point Total		NA	2E-13	NA	2E-13		NA	NA	NA	NA
	Exposure Medium Total			NA	2E-13	NA	2E-13		NA	NA	NA	NA
Sediment Total				1E-08	2E-13	9E-09	2E-08		0.002	NA	0.001	0.004
Receptor Total				1E-08	2E-13	9E-09	2E-08		0.002	NA	0.001	0.004

NA = Not applicable or not available

Total Fingernails HI Across Media =	0.004
Total Eyes HI Across Media =	0.004

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Wader/Sunbather
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment Exposure Unit 2	Total PCBs	4E-08	NA	1E-07	2E-07	Fingernails, Eyes	0.003	NA	0.01	0.01
		Exposure Point Total		4E-08	NA	1E-07	2E-07		0.003	NA	0.01	0.01
	Exposure Medium Total			4E-08	NA	1E-07	2E-07		0.003	NA	0.01	0.01
	Ambient Air	Ambient Air Exposure Unit 2	Total PCBs	NA	8E-13	NA	8E-13	NA	NA	NA	NA	NA
		Exposure Point Total		NA	8E-13	NA	8E-13		NA	NA	NA	NA
	Exposure Medium Total			NA	8E-13	NA	8E-13		NA	NA	NA	NA
Sediment Total				4E-08	8E-13	1E-07	2E-07		0.003	NA	0.01	0.01
Receptor Total				4E-08	8E-13	1E-07	2E-07		0.003	NA	0.01	0.01

NA = Not applicable or not available

Total Fingernails HI Across Media =	0.01
Total Eyes HI Across Media =	0.01

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Wader/Sunbather
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment Exposure Unit 2	Total PCBs	9E-08	NA	6E-08	1E-07	Fingernails, Eyes	0.03	NA	0.02	0.04
		Exposure Point Total		9E-08	NA	6E-08	1E-07		0.03	NA	0.02	0.04
	Exposure Medium Total			9E-08	NA	6E-08	1E-07		0.03	NA	0.02	0.04
	Ambient Air	Ambient Air Exposure Unit 2	Total PCBs	NA	2E-13	NA	2E-13	NA	NA	NA	NA	NA
		Exposure Point Total		NA	2E-13	NA	2E-13		NA	NA	NA	NA
	Exposure Medium Total			NA	2E-13	NA	2E-13		NA	NA	NA	NA
Sediment Total				9E-08	2E-13	6E-08	1E-07		0.03	NA	0.02	0.04
Receptor Total				9E-08	2E-13	6E-08	1E-07		0.03	NA	0.02	0.04

NA = Not applicable or not available

Total Fingernails HI Across Media =	0.04
Total Eyes HI Across Media =	0.04

Attachment F-2
Data and Sample Populations Used in HHRA

ATTACHMENT F-2

Data and Sample Populations Used in HHRA

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

AOC ID	Station ID	Collection Date	Sample ID	Upper Depth (feet)	Lower Depth (feet)	Param Name	Result	Qualifier	Units	Detected	Detection Limit	Reporting Limit
EU 1	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1016	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 1	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1232	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1242	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1248	0.14	J	mg/Kg	Yes	0.0081	0.032
EU 1	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1254	0.14	J	mg/Kg	Yes	0.0081	0.032
EU 1	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1260	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU01	4/26/2012	TMC-DU01	0	0.5	Total PCBs	0.28	=	mg/Kg	Yes	NA	NA
EU 1	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1016	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 1	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1232	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1242	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1248	0.023	J	mg/Kg	Yes	0.0081	0.032
EU 1	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1254	0.026	J	mg/Kg	Yes	0.0081	0.032
EU 1	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1260	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU02	4/26/2012	TMC-DU02	0	0.5	Total PCBs	0.049	=	mg/Kg	Yes	NA	NA
EU 1	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1016	0.0083	UJ	mg/Kg	No	0.0083	0.033
EU 1	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.033
EU 1	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1232	0.0083	UJ	mg/Kg	No	0.0083	0.033
EU 1	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1242	0.0083	UJ	mg/Kg	No	0.0083	0.033
EU 1	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1248	0.048	J	mg/Kg	Yes	0.0083	0.033
EU 1	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1254	0.04	J	mg/Kg	Yes	0.0083	0.033
EU 1	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1260	0.0083	UJ	mg/Kg	No	0.0083	0.033
EU 1	DU03	4/27/2012	TMC-DU03	0	0.5	Total PCBs	0.088	=	mg/Kg	Yes	NA	NA
EU 1	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1016	0.008	UJ	mg/Kg	No	0.008	0.032
EU 1	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 1	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1232	0.008	UJ	mg/Kg	No	0.008	0.032
EU 1	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1242	0.008	UJ	mg/Kg	No	0.008	0.032
EU 1	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1248	0.052	J	mg/Kg	Yes	0.008	0.032
EU 1	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1254	0.041	J	mg/Kg	Yes	0.008	0.032
EU 1	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1260	0.008	UJ	mg/Kg	No	0.008	0.032
EU 1	DU04	4/27/2012	TMC-DU04	0	0.5	Total PCBs	0.093	=	mg/Kg	Yes	NA	NA
EU 1	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1016	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 1	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1232	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1242	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1248	0.054	J	mg/Kg	Yes	0.0081	0.032
EU 1	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1254	0.046	J	mg/Kg	Yes	0.0081	0.032
EU 1	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1260	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU05	4/27/2012	TMC-DU05	0	0.5	Total PCBs	0.1	=	mg/Kg	Yes	NA	NA
EU 1	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1016	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 1	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1232	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1242	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1248	0.071	J	mg/Kg	Yes	0.0081	0.032

ATTACHMENT F-2

Data and Sample Populations Used in HHRA

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

AOC ID	Station ID	Collection Date	Sample ID	Upper Depth (feet)	Lower Depth (feet)	Param Name	Result	Qualifier	Units	Detected	Detection Limit	Reporting Limit
EU 1	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1254	0.05	J	mg/Kg	Yes	0.0081	0.032
EU 1	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1260	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 1	DU06	5/1/2012	TMC-DU06-050112	0	0.5	Total PCBs	0.121	=	mg/Kg	Yes	NA	NA
EU 1	SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1016	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1221	0.017	U	mg/Kg	No	0.017	0.041
EU 1	SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1232	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1242	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1248	0.064	=	mg/Kg	Yes	0.01	0.041
EU 1	SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1254	0.058	=	mg/Kg	Yes	0.01	0.041
EU 1	SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1260	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD01	5/1/2012	TMC-SD01-0001	0	0.5	Total PCBs	0.122	=	mg/Kg	Yes	NA	NA
EU 1	SD02	5/1/2012	TMC-SD02-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD02	5/1/2012	TMC-SD02-0001	0	0.5	PCB-1221	0.018	U	mg/Kg	No	0.018	0.043
EU 1	SD02	5/1/2012	TMC-SD02-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD02	5/1/2012	TMC-SD02-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD02	5/1/2012	TMC-SD02-0001	0	0.5	PCB-1248	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD02	5/1/2012	TMC-SD02-0001	0	0.5	PCB-1254	0.038	J	mg/Kg	Yes	0.011	0.043
EU 1	SD02	5/1/2012	TMC-SD02-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD02	5/1/2012	TMC-SD02-0001	0	0.5	Total PCBs	0.038	=	mg/Kg	Yes	NA	NA
EU 1	SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1016	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1221	0.017	U	mg/Kg	No	0.017	0.04
EU 1	SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1232	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1242	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1248	0.33	J	mg/Kg	Yes	0.01	0.04
EU 1	SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1254	0.21	J	mg/Kg	Yes	0.01	0.04
EU 1	SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1260	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD03	5/1/2012	TMC-SD03-0001	0	0.5	Total PCBs	0.54	=	mg/Kg	Yes	NA	NA
EU 1	SD04	5/1/2012	TMC-SD04-0001	0	0.5	PCB-1016	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD04	5/1/2012	TMC-SD04-0001	0	0.5	PCB-1221	0.016	U	mg/Kg	No	0.016	0.04
EU 1	SD04	5/1/2012	TMC-SD04-0001	0	0.5	PCB-1232	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD04	5/1/2012	TMC-SD04-0001	0	0.5	PCB-1242	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD04	5/1/2012	TMC-SD04-0001	0	0.5	PCB-1248	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD04	5/1/2012	TMC-SD04-0001	0	0.5	PCB-1254	0.011	J	mg/Kg	Yes	0.01	0.04
EU 1	SD04	5/1/2012	TMC-SD04-0001	0	0.5	PCB-1260	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD04	5/1/2012	TMC-SD04-0001	0	0.5	Total PCBs	0.011	=	mg/Kg	Yes	NA	NA
EU 1	SD05	5/1/2012	TMC-SD05-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.046
EU 1	SD05	5/1/2012	TMC-SD05-0001	0	0.5	PCB-1221	0.019	U	mg/Kg	No	0.019	0.046
EU 1	SD05	5/1/2012	TMC-SD05-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.046
EU 1	SD05	5/1/2012	TMC-SD05-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.046
EU 1	SD05	5/1/2012	TMC-SD05-0001	0	0.5	PCB-1248	0.011	U	mg/Kg	No	0.011	0.046
EU 1	SD05	5/1/2012	TMC-SD05-0001	0	0.5	PCB-1254	0.011	U	mg/Kg	No	0.011	0.046
EU 1	SD05	5/1/2012	TMC-SD05-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.046
EU 1	SD05	5/1/2012	TMC-SD05-0001	0	0.5	Total PCBs	0	U	mg/Kg	No	NA	NA
EU 1	SD06	5/1/2012	TMC-SD06-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD06	5/1/2012	TMC-SD06-0001	0	0.5	PCB-1221	0.017	U	mg/Kg	No	0.017	0.042

ATTACHMENT F-2

Data and Sample Populations Used in HHRA

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

AOC ID	Station ID	Collection Date	Sample ID	Upper Depth (feet)	Lower Depth (feet)	Param Name	Result	Qualifier	Units	Detected	Detection Limit	Reporting Limit
EU 1	SD06	5/1/2012	TMC-SD06-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD06	5/1/2012	TMC-SD06-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD06	5/1/2012	TMC-SD06-0001	0	0.5	PCB-1248	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD06	5/1/2012	TMC-SD06-0001	0	0.5	PCB-1254	0.014	J	mg/Kg	Yes	0.011	0.042
EU 1	SD06	5/1/2012	TMC-SD06-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD06	5/1/2012	TMC-SD06-0001	0	0.5	Total PCBs	0.014	=	mg/Kg	Yes	NA	NA
EU 1	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1221	0.017	U	mg/Kg	No	0.017	0.042
EU 1	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1248	0.24	=	mg/Kg	Yes	0.011	0.042
EU 1	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1254	0.16	J	mg/Kg	Yes	0.011	0.042
EU 1	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD07	5/1/2012	TMC-SD07-0001	0	0.5	Total PCBs	0.4	=	mg/Kg	Yes	NA	NA
EU 1	SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1221	0.017	U	mg/Kg	No	0.017	0.042
EU 1	SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1248	0.061	=	mg/Kg	Yes	0.011	0.042
EU 1	SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1254	0.054	=	mg/Kg	Yes	0.011	0.042
EU 1	SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.042
EU 1	SD08	5/1/2012	TMC-SD08-0001	0	0.5	Total PCBs	0.115	=	mg/Kg	Yes	NA	NA
EU 1	SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1221	0.018	U	mg/Kg	No	0.018	0.043
EU 1	SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1248	0.1	=	mg/Kg	Yes	0.011	0.043
EU 1	SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1254	0.089	=	mg/Kg	Yes	0.011	0.043
EU 1	SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.043
EU 1	SD09	5/1/2012	TMC-SD09-0001	0	0.5	Total PCBs	0.189	=	mg/Kg	Yes	NA	NA
EU 1	SD10	5/1/2012	TMC-SD10-0001	0	0.5	PCB-1016	0.0098	UJ	mg/Kg	No	0.0098	0.039
EU 1	SD10	5/1/2012	TMC-SD10-0001	0	0.5	PCB-1221	0.016	UJ	mg/Kg	No	0.016	0.039
EU 1	SD10	5/1/2012	TMC-SD10-0001	0	0.5	PCB-1232	0.0098	UJ	mg/Kg	No	0.0098	0.039
EU 1	SD10	5/1/2012	TMC-SD10-0001	0	0.5	PCB-1242	0.0098	UJ	mg/Kg	No	0.0098	0.039
EU 1	SD10	5/1/2012	TMC-SD10-0001	0	0.5	PCB-1248	0.0098	UJ	mg/Kg	No	0.0098	0.039
EU 1	SD10	5/1/2012	TMC-SD10-0001	0	0.5	PCB-1254	0.0098	UJ	mg/Kg	No	0.0098	0.039
EU 1	SD10	5/1/2012	TMC-SD10-0001	0	0.5	PCB-1260	0.0098	UJ	mg/Kg	No	0.0098	0.039
EU 1	SD10	5/1/2012	TMC-SD10-0001	0	0.5	Total PCBs	0	U	mg/Kg	No	NA	NA
EU 1	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.044
EU 1	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1221	0.018	U	mg/Kg	No	0.018	0.044
EU 1	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.044
EU 1	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.044
EU 1	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1248	0.011	U	mg/Kg	No	0.011	0.044
EU 1	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1254	0.011	U	mg/Kg	No	0.011	0.044
EU 1	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.044

ATTACHMENT F-2

Data and Sample Populations Used in HHRA

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

AOC ID	Station ID	Collection Date	Sample ID	Upper Depth (feet)	Lower Depth (feet)	Param Name	Result	Qualifier	Units	Detected	Detection Limit	Reporting Limit
EU 1	SD11	5/2/2012	TMC-SD11-0001	0	0.5	Total PCBs	0	U	mg/Kg	No	NA	NA
EU 1	SD12	5/2/2012	TMC-SD12-0001	0	0.5	PCB-1016	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD12	5/2/2012	TMC-SD12-0001	0	0.5	PCB-1221	0.017	U	mg/Kg	No	0.017	0.041
EU 1	SD12	5/2/2012	TMC-SD12-0001	0	0.5	PCB-1232	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD12	5/2/2012	TMC-SD12-0001	0	0.5	PCB-1242	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD12	5/2/2012	TMC-SD12-0001	0	0.5	PCB-1248	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD12	5/2/2012	TMC-SD12-0001	0	0.5	PCB-1254	0.0065	J	mg/Kg	Yes	0.01	0.041
EU 1	SD12	5/2/2012	TMC-SD12-0001	0	0.5	PCB-1260	0.01	U	mg/Kg	No	0.01	0.041
EU 1	SD12	5/2/2012	TMC-SD12-0001	0	0.5	Total PCBs	0.0065	=	mg/Kg	Yes	NA	NA
EU 1	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1016	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1221	0.016	U	mg/Kg	No	0.016	0.04
EU 1	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1232	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1242	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1248	0.029	J	mg/Kg	Yes	0.01	0.04
EU 1	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1254	0.037	J	mg/Kg	Yes	0.01	0.04
EU 1	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1260	0.01	U	mg/Kg	No	0.01	0.04
EU 1	SD13	5/2/2012	TMC-SD13-0001	0	0.5	Total PCBs	0.066	=	mg/Kg	Yes	NA	NA
EU 1	SD14	5/2/2012	TMC-SD14-0001	0	0.5	PCB-1016	0.0097	U	mg/Kg	No	0.0097	0.039
EU 1	SD14	5/2/2012	TMC-SD14-0001	0	0.5	PCB-1221	0.016	U	mg/Kg	No	0.016	0.039
EU 1	SD14	5/2/2012	TMC-SD14-0001	0	0.5	PCB-1232	0.0097	U	mg/Kg	No	0.0097	0.039
EU 1	SD14	5/2/2012	TMC-SD14-0001	0	0.5	PCB-1242	0.0097	U	mg/Kg	No	0.0097	0.039
EU 1	SD14	5/2/2012	TMC-SD14-0001	0	0.5	PCB-1248	0.0097	U	mg/Kg	No	0.0097	0.039
EU 1	SD14	5/2/2012	TMC-SD14-0001	0	0.5	PCB-1254	0.0082	J	mg/Kg	Yes	0.0097	0.039
EU 1	SD14	5/2/2012	TMC-SD14-0001	0	0.5	PCB-1260	0.0097	U	mg/Kg	No	0.0097	0.039
EU 1	SD14	5/2/2012	TMC-SD14-0001	0	0.5	Total PCBs	0.0082	=	mg/Kg	Yes	NA	NA
EU 2	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1016	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 2	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1232	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1242	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1248	0.14	J	mg/Kg	Yes	0.0081	0.032
EU 2	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1254	0.14	J	mg/Kg	Yes	0.0081	0.032
EU 2	DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1260	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU01	4/26/2012	TMC-DU01	0	0.5	Total PCBs	0.28	=	mg/Kg	Yes	NA	NA
EU 2	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1016	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 2	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1232	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1242	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1248	0.023	J	mg/Kg	Yes	0.0081	0.032
EU 2	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1254	0.026	J	mg/Kg	Yes	0.0081	0.032
EU 2	DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1260	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU02	4/26/2012	TMC-DU02	0	0.5	Total PCBs	0.049	=	mg/Kg	Yes	NA	NA
EU 2	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1016	0.0083	UJ	mg/Kg	No	0.0083	0.033
EU 2	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.033
EU 2	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1232	0.0083	UJ	mg/Kg	No	0.0083	0.033
EU 2	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1242	0.0083	UJ	mg/Kg	No	0.0083	0.033

ATTACHMENT F-2

Data and Sample Populations Used in HHRA

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

AOC ID	Station ID	Collection Date	Sample ID	Upper Depth (feet)	Lower Depth (feet)	Param Name	Result	Qualifier	Units	Detected	Detection Limit	Reporting Limit
EU 2	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1248	0.048	J	mg/Kg	Yes	0.0083	0.033
EU 2	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1254	0.04	J	mg/Kg	Yes	0.0083	0.033
EU 2	DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1260	0.0083	UJ	mg/Kg	No	0.0083	0.033
EU 2	DU03	4/27/2012	TMC-DU03	0	0.5	Total PCBs	0.088	=	mg/Kg	Yes	NA	NA
EU 2	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1016	0.008	UJ	mg/Kg	No	0.008	0.032
EU 2	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 2	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1232	0.008	UJ	mg/Kg	No	0.008	0.032
EU 2	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1242	0.008	UJ	mg/Kg	No	0.008	0.032
EU 2	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1248	0.052	J	mg/Kg	Yes	0.008	0.032
EU 2	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1254	0.041	J	mg/Kg	Yes	0.008	0.032
EU 2	DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1260	0.008	UJ	mg/Kg	No	0.008	0.032
EU 2	DU04	4/27/2012	TMC-DU04	0	0.5	Total PCBs	0.093	=	mg/Kg	Yes	NA	NA
EU 2	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1016	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 2	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1232	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1242	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1248	0.054	J	mg/Kg	Yes	0.0081	0.032
EU 2	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1254	0.046	J	mg/Kg	Yes	0.0081	0.032
EU 2	DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1260	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU05	4/27/2012	TMC-DU05	0	0.5	Total PCBs	0.1	=	mg/Kg	Yes	NA	NA
EU 2	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1016	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1221	0.013	UJ	mg/Kg	No	0.013	0.032
EU 2	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1232	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1242	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1248	0.071	J	mg/Kg	Yes	0.0081	0.032
EU 2	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1254	0.05	J	mg/Kg	Yes	0.0081	0.032
EU 2	DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1260	0.0081	UJ	mg/Kg	No	0.0081	0.032
EU 2	DU06	5/1/2012	TMC-DU06-050112	0	0.5	Total PCBs	0.121	=	mg/Kg	Yes	NA	NA
EU 2	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.042
EU 2	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1221	0.017	U	mg/Kg	No	0.017	0.042
EU 2	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.042
EU 2	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.042
EU 2	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1248	0.24	=	mg/Kg	Yes	0.011	0.042
EU 2	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1254	0.16	J	mg/Kg	Yes	0.011	0.042
EU 2	SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.042
EU 2	SD07	5/1/2012	TMC-SD07-0001	0	0.5	Total PCBs	0.4	=	mg/Kg	Yes	NA	NA
EU 2	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1016	0.011	U	mg/Kg	No	0.011	0.044
EU 2	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1221	0.018	U	mg/Kg	No	0.018	0.044
EU 2	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1232	0.011	U	mg/Kg	No	0.011	0.044
EU 2	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1242	0.011	U	mg/Kg	No	0.011	0.044
EU 2	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1248	0.011	U	mg/Kg	No	0.011	0.044
EU 2	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1254	0.011	U	mg/Kg	No	0.011	0.044
EU 2	SD11	5/2/2012	TMC-SD11-0001	0	0.5	PCB-1260	0.011	U	mg/Kg	No	0.011	0.044
EU 2	SD11	5/2/2012	TMC-SD11-0001	0	0.5	Total PCBs	0	U	mg/Kg	No	NA	NA
EU 2	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1016	0.01	U	mg/Kg	No	0.01	0.04

ATTACHMENT F-2

Data and Sample Populations Used in HHRA

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

AOC ID	Station ID	Collection Date	Sample ID	Upper Depth (feet)	Lower Depth (feet)	Param Name	Result	Qualifier	Units	Detected	Detection Limit	Reporting Limit
EU 2	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1221	0.016	U	mg/Kg	No	0.016	0.04
EU 2	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1232	0.01	U	mg/Kg	No	0.01	0.04
EU 2	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1242	0.01	U	mg/Kg	No	0.01	0.04
EU 2	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1248	0.029	J	mg/Kg	Yes	0.01	0.04
EU 2	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1254	0.037	J	mg/Kg	Yes	0.01	0.04
EU 2	SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1260	0.01	U	mg/Kg	No	0.01	0.04
EU 2	SD13	5/2/2012	TMC-SD13-0001	0	0.5	Total PCBs	0.066	=	mg/Kg	Yes	NA	NA

Notes:

AOC = Area of concern

EU = Exposure unit

HHRA = Human Health Risk Assessment

J = Compound was detected below the reporting limit in the sample

mg/kg = milligram per kilogram

NA = Not applicable

PCB = Polychlorinated biphenyl

U = Nondetect

Attachment F-3
Calculation of Total PCBs

ATTACHMENT F-3

Calculation of Total PCBs

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

Station ID	Upper Depth (feet)	Lower Depth (feet)	Date Collected	Sample ID	Units	PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260	Total PCBs
DU01	0	0.5	04/26/2012	TMC-DU01	mg/kg	0	0	0	0	0.14	0.14	0	0.28
DU02	0	0.5	04/26/2012	TMC-DU02	mg/kg	0	0	0	0	0.023	0.026	0	0.049
DU03	0	0.5	04/27/2012	TMC-DU03	mg/kg	0	0	0	0	0.048	0.04	0	0.088
DU04	0	0.5	04/27/2012	TMC-DU04	mg/kg	0	0	0	0	0.052	0.041	0	0.093
DU05	0	0.5	04/27/2012	TMC-DU05	mg/kg	0	0	0	0	0.054	0.046	0	0.1
DU06	0	0.5	05/01/2012	TMC-DU06-050112	mg/kg	0	0	0	0	0.071	0.05	0	0.121
SD01	0	0.5	05/01/2012	TMC-SD01-0001	mg/kg	0	0	0	0	0.064	0.058	0	0.122
SD02	0	0.5	05/01/2012	TMC-SD02-0001	mg/kg	0	0	0	0	0	0.038	0	0.038
SD03	0	0.5	05/01/2012	TMC-SD03-0001	mg/kg	0	0	0	0	0.33	0.21	0	0.54
SD04	0	0.5	05/01/2012	TMC-SD04-0001	mg/kg	0	0	0	0	0	0.011	0	0.011
SD05	0	0.5	05/01/2012	TMC-SD05-0001	mg/kg	0	0	0	0	0	0	0	0
SD06	0	0.5	05/01/2012	TMC-SD06-0001	mg/kg	0	0	0	0	0	0.014	0	0.014
SD07	0	0.5	05/01/2012	TMC-SD07-0001	mg/kg	0	0	0	0	0.24	0.16	0	0.4
SD08	0	0.5	05/01/2012	TMC-SD08-0001	mg/kg	0	0	0	0	0.061	0.054	0	0.115
SD09	0	0.5	05/01/2012	TMC-SD09-0001	mg/kg	0	0	0	0	0.1	0.089	0	0.189
SD10	0	0.5	05/01/2012	TMC-SD10-0001	mg/kg	0	0	0	0	0	0	0	0
SD11	0	0.5	05/02/2012	TMC-SD11-0001	mg/kg	0	0	0	0	0	0	0	0
SD12	0	0.5	05/02/2012	TMC-SD12-0001	mg/kg	0	0	0	0	0	0.0065	0	0.0065
SD13	0	0.5	05/02/2012	TMC-SD13-0001	mg/kg	0	0	0	0	0.029	0.037	0	0.066
SD14	0	0.5	05/02/2012	TMC-SD14-0001	mg/kg	0	0	0	0	0	0.0082	0	0.0082

Notes:

Nondetected results are included as zero.

mg/kg = milligram per kilogram

PCB = Polychlorinated biphenyl

Attachment F-4
Hot Spot Evaluation

ATTACHMENT F-4

Hot Spot Evaluation

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

Station ID	Collection Date	Sample ID	Upper Depth (feet)	Lower Depth (feet)	Param Name	Result	Qualifier	Units	Adjusted RSL [1]	100x Adjusted RSL	Result Exceeds 100x Adjusted RSL
DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1248	0.14	J	mg/kg	0.22	22	No
DU01	4/26/2012	TMC-DU01	0	0.5	PCB-1254	0.14	J	mg/kg	0.11	11	No
DU01	4/26/2012	TMC-DU01	0	0.5	Total PCBs	0.28	=	mg/kg	0.11	11	No
DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1248	0.023	J	mg/kg	0.22	22	No
DU02	4/26/2012	TMC-DU02	0	0.5	PCB-1254	0.026	J	mg/kg	0.11	11	No
DU02	4/26/2012	TMC-DU02	0	0.5	Total PCBs	0.049	=	mg/kg	0.11	11	No
DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1248	0.048	J	mg/kg	0.22	22	No
DU03	4/27/2012	TMC-DU03	0	0.5	PCB-1254	0.04	J	mg/kg	0.11	11	No
DU03	4/27/2012	TMC-DU03	0	0.5	Total PCBs	0.088	=	mg/kg	0.11	11	No
DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1248	0.052	J	mg/kg	0.22	22	No
DU04	4/27/2012	TMC-DU04	0	0.5	PCB-1254	0.041	J	mg/kg	0.11	11	No
DU04	4/27/2012	TMC-DU04	0	0.5	Total PCBs	0.093	=	mg/kg	0.11	11	No
DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1248	0.054	J	mg/kg	0.22	22	No
DU05	4/27/2012	TMC-DU05	0	0.5	PCB-1254	0.046	J	mg/kg	0.11	11	No
DU05	4/27/2012	TMC-DU05	0	0.5	Total PCBs	0.1	=	mg/kg	0.11	11	No
DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1248	0.071	J	mg/kg	0.22	22	No
DU06	5/1/2012	TMC-DU06-050112	0	0.5	PCB-1254	0.05	J	mg/kg	0.11	11	No
DU06	5/1/2012	TMC-DU06-050112	0	0.5	Total PCBs	0.121	=	mg/kg	0.11	11	No
SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1248	0.064	=	mg/kg	0.22	22	No
SD01	5/1/2012	TMC-SD01-0001	0	0.5	PCB-1254	0.058	=	mg/kg	0.11	11	No
SD01	5/1/2012	TMC-SD01-0001	0	0.5	Total PCBs	0.122	=	mg/kg	0.11	11	No
SD02	5/1/2012	TMC-SD02-0001	0	0.5	PCB-1254	0.038	J	mg/kg	0.11	11	No
SD02	5/1/2012	TMC-SD02-0001	0	0.5	Total PCBs	0.038	=	mg/kg	0.11	11	No
SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1248	0.33	J	mg/kg	0.22	22	No
SD03	5/1/2012	TMC-SD03-0001	0	0.5	PCB-1254	0.21	J	mg/kg	0.11	11	No
SD03	5/1/2012	TMC-SD03-0001	0	0.5	Total PCBs	0.54	=	mg/kg	0.11	11	No
SD04	5/1/2012	TMC-SD04-0001	0	0.5	PCB-1254	0.011	J	mg/kg	0.11	11	No
SD04	5/1/2012	TMC-SD04-0001	0	0.5	Total PCBs	0.011	=	mg/kg	0.11	11	No
SD06	5/1/2012	TMC-SD06-0001	0	0.5	PCB-1254	0.014	J	mg/kg	0.11	11	No
SD06	5/1/2012	TMC-SD06-0001	0	0.5	Total PCBs	0.014	=	mg/kg	0.11	11	No
SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1248	0.24	=	mg/kg	0.22	22	No
SD07	5/1/2012	TMC-SD07-0001	0	0.5	PCB-1254	0.16	J	mg/kg	0.11	11	No
SD07	5/1/2012	TMC-SD07-0001	0	0.5	Total PCBs	0.4	=	mg/kg	0.11	11	No
SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1248	0.061	=	mg/kg	0.22	22	No
SD08	5/1/2012	TMC-SD08-0001	0	0.5	PCB-1254	0.054	=	mg/kg	0.11	11	No
SD08	5/1/2012	TMC-SD08-0001	0	0.5	Total PCBs	0.115	=	mg/kg	0.11	11	No
SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1248	0.1	=	mg/kg	0.22	22	No
SD09	5/1/2012	TMC-SD09-0001	0	0.5	PCB-1254	0.089	=	mg/kg	0.11	11	No
SD09	5/1/2012	TMC-SD09-0001	0	0.5	Total PCBs	0.189	=	mg/kg	0.11	11	No
SD12	5/2/2012	TMC-SD12-0001	0	0.5	PCB-1254	0.0065	J	mg/kg	0.11	11	No
SD12	5/2/2012	TMC-SD12-0001	0	0.5	Total PCBs	0.0065	=	mg/kg	0.11	11	No
SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1248	0.029	J	mg/kg	0.22	22	No
SD13	5/2/2012	TMC-SD13-0001	0	0.5	PCB-1254	0.037	J	mg/kg	0.11	11	No
SD13	5/2/2012	TMC-SD13-0001	0	0.5	Total PCBs	0.066	=	mg/kg	0.11	11	No
SD14	5/2/2012	TMC-SD14-0001	0	0.5	PCB-1254	0.0082	J	mg/kg	0.11	11	No
SD14	5/2/2012	TMC-SD14-0001	0	0.5	Total PCBs	0.0082	=	mg/kg	0.11	11	No

Notes:

Only detected concentrations are included in this table.

[1] Regional Screening Levels for Residential Soil (May 2012). Concentrations based on non-carcinogenic health effects are adjusted using hazard quotient = 0.1.

J = Compound was detected below the reporting limit in the sample.

mg/kg = milligram per kilogram

PCB = Polychlorinated biphenyl

RSL = Regional Screening Level

Attachment F-5
ProUCL Output

ATTACHMENT F-5

ProUCL Output—Exposure Unit 1

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2,000

Total PCBs (mg/Kg)

General Statistics

Number of Valid Observations	17	Number of Distinct Observations	17

Raw Statistics		Log-transformed Statistics	
Minimum	0.0065	Minimum of Log Data	-5.036
Maximum	0.54	Maximum of Log Data	-0.616
Mean	0.132	Mean of log Data	-2.681
Geometric Mean	0.0685	SD of log Data	1.323
Median	0.093		
SD	0.148		
Std. Error of Mean	0.0358		
Coefficient of Variation	1.119		
Skewness	1.801		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.78	Shapiro Wilk Test Statistic	0.94
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.194	95% H-UCL	0.47
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.393
95% Adjusted-CLT UCL (Chen-1995)	0.207	97.5% Chebyshev (MVUE) UCL	0.497
95% Modified-t UCL (Johnson-1978)	0.197	99% Chebyshev (MVUE) UCL	0.703

Gamma Distribution Test		Data Distribution
k star (bias corrected)	0.775	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.17	
MLE of Mean	0.132	
MLE of Standard Deviation	0.15	
nu star	26.35	
Approximate Chi Square Value (.05)	15.65	**Nonparametric Statistics**
Adjusted Level of Significance	0.0346	95% CLT UCL 0.191
Adjusted Chi Square Value	14.79	95% Jackknife UCL 0.194
		95% Standard Bootstrap UCL 0.186
Anderson-Darling Test Statistic	0.3	95% Bootstrap-t UCL 0.25
Anderson-Darling 5% Critical Value	0.77	95% Hall's Bootstrap UCL 0.266
Kolmogorov-Smirnov Test Statistic	0.152	95% Percentile Bootstrap UCL 0.192
Kolmogorov-Smirnov 5% Critical Value	0.216	95% BCA Bootstrap UCL 0.211
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 0.288
		97.5% Chebyshev(Mean, Sd) UCL 0.355
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 0.488
95% Approximate Gamma UCL (Use when n >= 40)	0.222	
95% Adjusted Gamma UCL (Use when n < 40)	0.235	

Potential UCL to Use	
Use 95% Approximate Gamma UCL	0.222

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

ATTACHMENT F-5

ProUCL Output—Exposure Unit 2

Operable Unit 2 of the Twelvemile Creek Superfund Site, Pickens County, South Carolina

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Total PCBs (mg/Kg)

General Statistics

Number of Valid Observations	8	Number of Distinct Observations	8

Raw Statistics		Log-transformed Statistics	
Minimum	0.049	Minimum of Log Data	-3.016
Maximum	0.4	Maximum of Log Data	-0.916
Mean	0.15	Mean of log Data	-2.143
Geometric Mean	0.117	SD of log Data	0.709
Median	0.0965		
SD	0.124		
Std. Error of Mean	0.0437		
Coefficient of Variation	0.827		
Skewness	1.585		

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.765	Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.818	Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	0.232	95% H-UCL	0.315
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.307
95% Adjusted-CLT UCL (Chen-1995)	0.248	97.5% Chebyshev (MVUE) UCL	0.377
95% Modified-t UCL (Johnson-1978)	0.237	99% Chebyshev (MVUE) UCL	0.514

Gamma Distribution Test		Data Distribution
k star (bias corrected)	1.463	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.102	
MLE of Mean	0.15	
MLE of Standard Deviation	0.124	
nu star	23.41	
Approximate Chi Square Value (.05)	13.4	
Adjusted Level of Significance	0.0195	
Adjusted Chi Square Value	11.53	
Anderson-Darling Test Statistic	0.619	
Anderson-Darling 5% Critical Value	0.723	
Kolmogorov-Smirnov Test Statistic	0.28	
Kolmogorov-Smirnov 5% Critical Value	0.297	
Data appear Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
95% CLT UCL	0.222
95% Jackknife UCL	0.232
95% Standard Bootstrap UCL	0.216
95% Bootstrap-t UCL	0.494
95% Hall's Bootstrap UCL	0.75
95% Percentile Bootstrap UCL	0.225
95% BCA Bootstrap UCL	0.235
95% Chebyshev(Mean, Sd) UCL	0.34
97.5% Chebyshev(Mean, Sd) UCL	0.423
99% Chebyshev(Mean, Sd) UCL	0.585

Assuming Gamma Distribution

95% Approximate Gamma UCL (Use when n >= 40)	0.261
95% Adjusted Gamma UCL (Use when n < 40)	0.304

Potential UCL to Use	
Use 95% Approximate Gamma UCL	0.261

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Attachment F-6
Channel Flow Plots and Flow-Duration Curve

Figure 1. Water depth at 100 ft^3/s

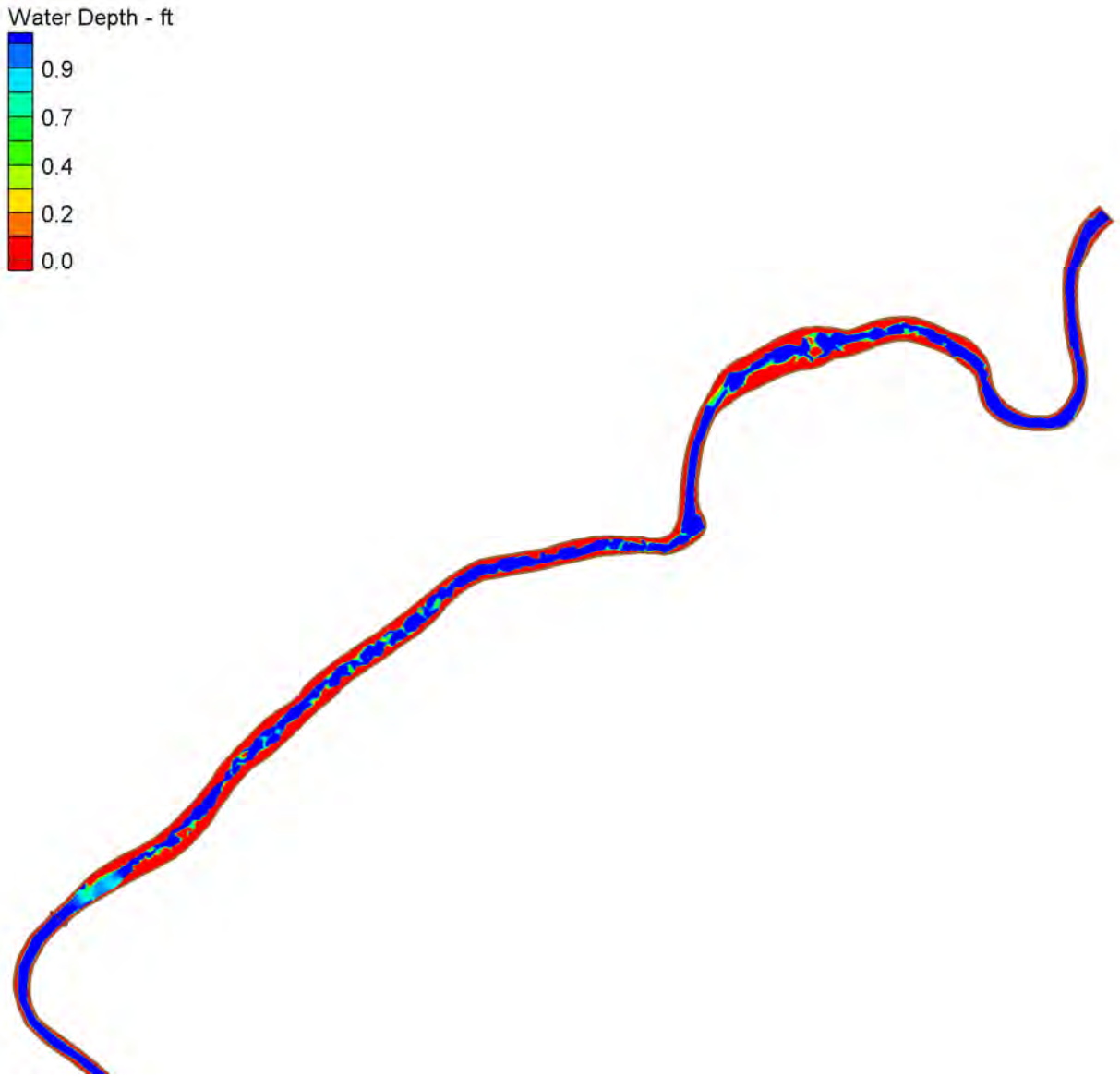


Figure 2. Water depth at 200 ft^3/s

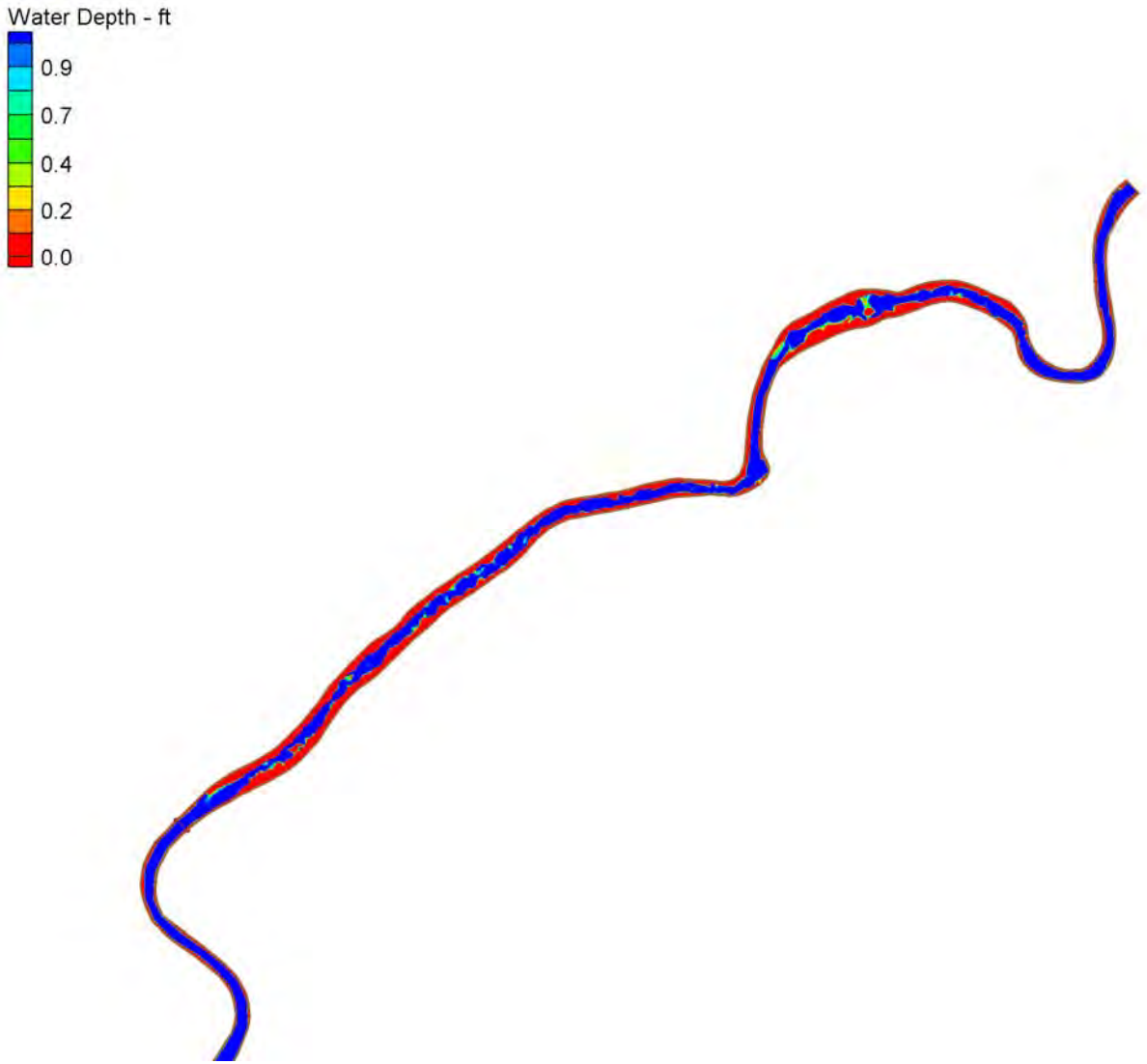


Figure 3. Water depth at 300 ft^3/s

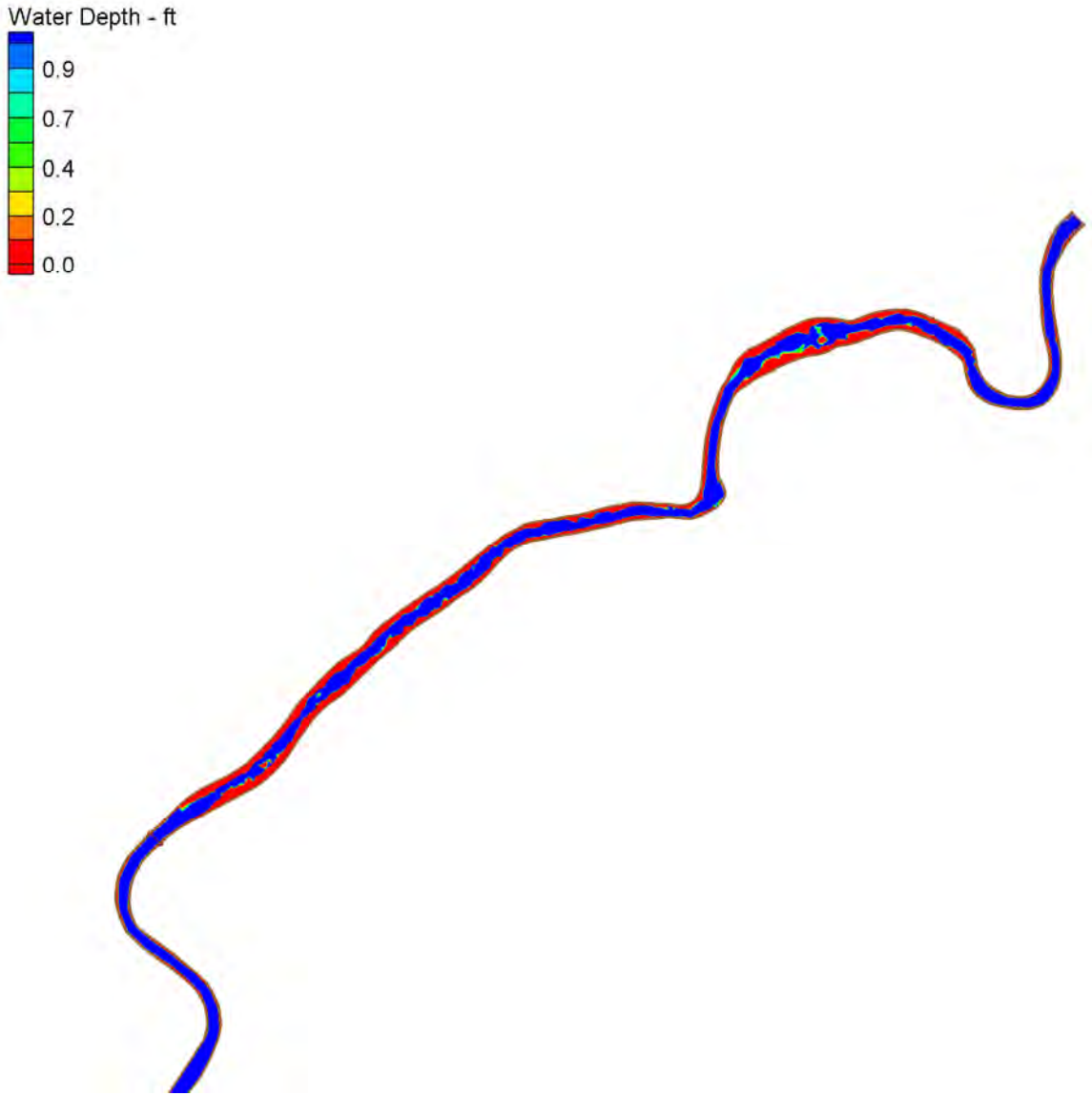
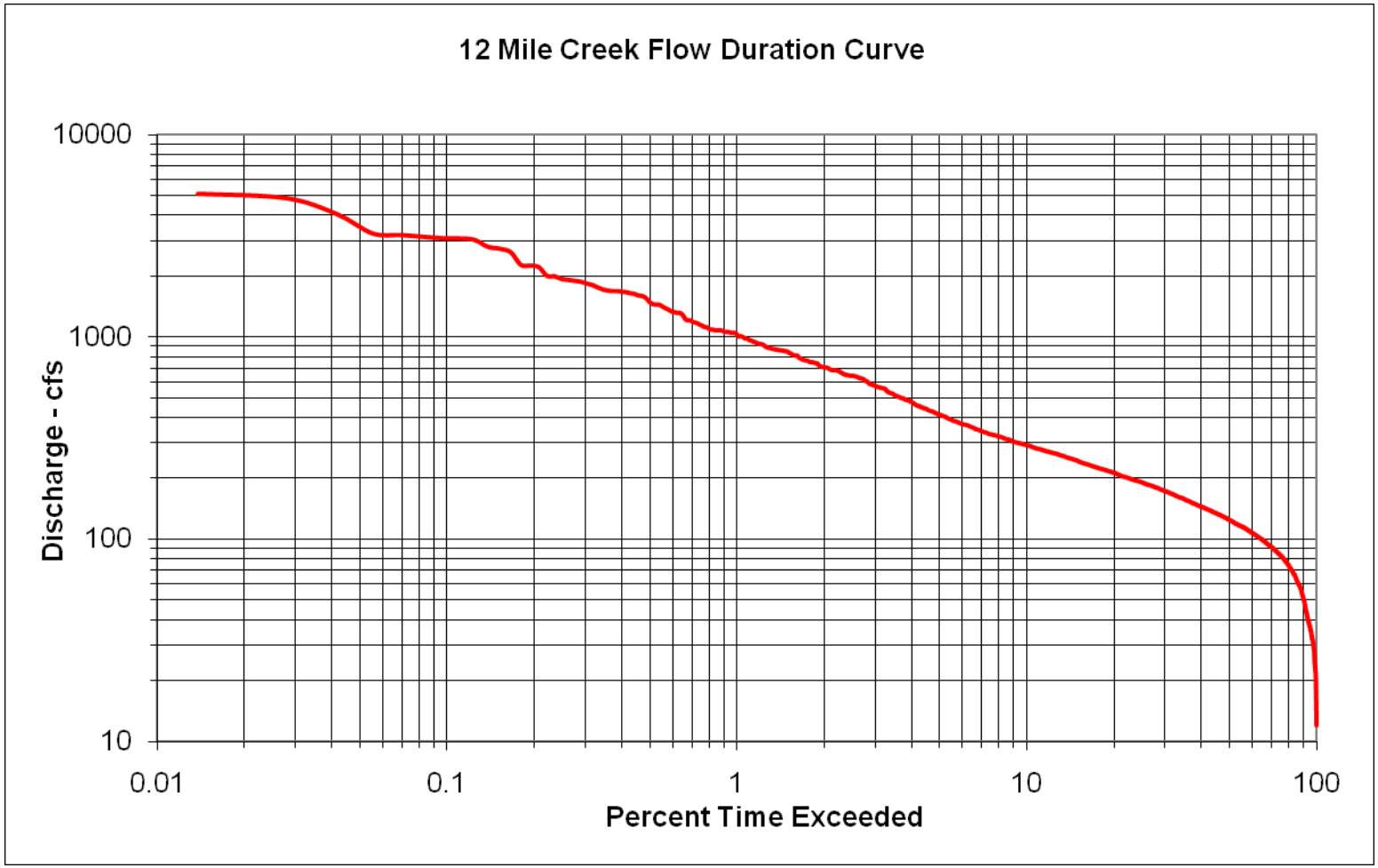


Figure 4. Water depth at 500 ft^3/s


12 Mile Creek Flow Duration Curve
10000
1000
100
10
Discharge - cfs
0.01
0.1
1
10
100
Percent Time Exceeded

Attachment F-7
Risk Calculations Using Maximum Detected Concentrations

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

RISK CALCULATIONS USING MAXIMUM DETECTED CONCENTRATIONS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Kayaker / Boater
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment Exposure Unit 1	Ingestion	Total PCBs	5.4E-01	mg/kg	2.4E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	5E-08	7.0E-08	mg/kg-day	2.0E-05	mg/kg-day	0.003
			Exp. Route Total								5E-08					0.003
Sediment	Sediment	Sediment Exposure Unit 1	Dermal	Total PCBs	5.4E-01	mg/kg	2.4E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	5E-08	7.0E-08	mg/kg-day	2.0E-05	mg/kg-day	0.004
			Exp. Route Total								5E-08					0.004
		Exposure Point Total									1E-07					0.007
	Exposure Medium Total										1E-07					0.007
Sediment	Ambient Air	Ambient Air Exposure Unit 1	Inhalation	Total PCBs	3.4E-10	mg/m^3	1.8E-12	mg/m^3	5.7E-04	$1/(\mu g/m^3)$	1E-12	5.1E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								1E-12					NA
		Exposure Point Total									1E-12					NA
	Exposure Medium Total										1E-12					NA
Sediment Total											1E-07					0.007
Receptor Total											1E-07					0.007

NA = Not applicable.

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

RISK CALCULATIONS USING MAXIMUM DETECTED CONCENTRATIONS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Kayaker / Boater
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment Exposure Unit 1	Ingestion	Total PCBs	5.4E-01	mg/kg	1.5E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	3E-08	1.1E-07	mg/kg-day	2.0E-05	mg/kg-day	0.005
			Exp. Route Total								3E-08					0.005
Sediment	Sediment	Sediment Exposure Unit 1	Dermal	Total PCBs	5.4E-01	mg/kg	1.0E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	2E-08	7.3E-08	mg/kg-day	2.0E-05	mg/kg-day	0.004
			Exp. Route Total								2E-08					0.004
		Exposure Point Total									5E-08					0.009
	Exposure Medium Total										5E-08					0.009
Sediment	Ambient Air	Ambient Air Exposure Unit 1	Inhalation	Total PCBs	3.4E-10	mg/m^3	7.3E-13	mg/m^3	5.7E-04	$1/(\mu g/m^3)$	4E-13	5.1E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								4E-13					NA
		Exposure Point Total									4E-13					NA
	Exposure Medium Total										4E-13					NA
Sediment Total											5E-08					0.009
Receptor Total											5E-08					0.009

NA = Not applicable.

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

RISK CALCULATIONS USING MAXIMUM DETECTED CONCENTRATIONS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Wader / Sunbather
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment Exposure Unit 2	Ingestion	Total PCBs	4.0E-01	mg/kg	3.0E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	6E-08	8.8E-08	mg/kg-day	2.0E-05	mg/kg-day	0.004
			Exp. Route Total								6E-08					0.004
Sediment	Sediment	Sediment Exposure Unit 2	Dermal	Total PCBs	4.0E-01	mg/kg	1.0E-07	mg/kg-day	2.0E+00	1/(mg/kg-day)	2E-07	2.9E-07	mg/kg-day	2.0E-05	mg/kg-day	0.01
			Exp. Route Total								2E-07					0.01
		Exposure Point Total									3E-07					0.02
	Exposure Medium Total										3E-07					0.02
Sediment	Ambient Air	Ambient Air Exposure Unit 2	Inhalation	Total PCBs	2.5E-10	mg/m^3	2.2E-12	mg/m^3	5.7E-04	$1/(\mu g/m^3)$	1E-12	6.4E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								1E-12					NA
		Exposure Point Total									1E-12					NA
	Exposure Medium Total										1E-12					NA
Sediment Total											3E-07					0.02
Receptor Total											3E-07					0.02

NA = Not applicable.

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

RISK CALCULATIONS USING MAXIMUM DETECTED CONCENTRATIONS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Wader / Sunbather
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Sediment Exposure Unit 2	Ingestion	Total PCBs	4.0E-01	mg/kg	7.0E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	1E-07	8.2E-07	mg/kg-day	2.0E-05	mg/kg-day	0.04
			Exp. Route Total								1E-07					0.04
Sediment	Sediment	Sediment Exposure Unit 2	Dermal	Total PCBs	4.0E-01	mg/kg	4.2E-08	mg/kg-day	2.0E+00	1/(mg/kg-day)	8E-08	4.9E-07	mg/kg-day	2.0E-05	mg/kg-day	0.02
			Exp. Route Total								8E-08					0.02
		Exposure Point Total									2E-07					0.07
	Exposure Medium Total										2E-07					0.07
Sediment	Ambient Air	Ambient Air Exposure Unit 2	Inhalation	Total PCBs	2.5E-10	mg/m^3	5.5E-13	mg/m^3	5.7E-04	$1/(\mu g/m^3)$	3E-13	6.4E-12	mg/m^3	NA	NA	NA
			Exp. Route Total								3E-13					NA
		Exposure Point Total									3E-13					NA
	Exposure Medium Total										3E-13					NA
Sediment Total											2E-07					0.07
Receptor Total											2E-07					0.07

NA = Not applicable.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

RISK CALCULATIONS USING MAXIMUM DETECTED CONCENTRATIONS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Kayaker / Boater
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment Exposure Unit 1	Total PCBs	5E-08	NA	5E-08	1E-07	Fingernails, Eyes	0.003	NA	0.004	0.007
		Exposure Point Total		5E-08	NA	5E-08	1E-07		0.003	NA	0.004	0.007
	Exposure Medium Total			5E-08	NA	5E-08	1E-07		0.003	NA	0.004	0.007
	Ambient Air	Ambient Air Exposure Unit 1	Total PCBs	NA	1E-12	NA	1E-12	NA	NA	NA	NA	NA
		Exposure Point Total		NA	1E-12	NA	1E-12		NA	NA	NA	NA
	Exposure Medium Total			NA	1E-12	NA	1E-12		NA	NA	NA	NA
Medium Total				5E-08	1E-12	5E-08	1E-07		0.003	NA	0.004	0.007
Receptor Total				5E-08	1E-12	5E-08	1E-07		0.003	NA	0.004	0.007

NA = Not applicable or not available

Total Fingernails HI Across Media = 0.007

Total Eyes HI Across Media = 0.007

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

RISK CALCULATIONS USING MAXIMUM DETECTED CONCENTRATIONS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Kayaker / Boater
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment Exposure Unit 1	Total PCBs	3E-08	NA	2E-08	5E-08	Fingernails, Eyes	0.005	NA	0.004	0.009
		Exposure Point Total		3E-08	NA	2E-08	5E-08		0.005	NA	0.004	0.009
	Exposure Medium Total			3E-08	NA	2E-08	5E-08		0.005	NA	0.004	0.009
	Ambient Air	Ambient Air Exposure Unit 1	Total PCBs	NA	4E-13	NA	4E-13	NA	NA	NA	NA	NA
		Exposure Point Total		NA	4E-13	NA	4E-13		NA	NA	NA	NA
	Exposure Medium Total			NA	4E-13	NA	4E-13		NA	NA	NA	NA
Medium Total				3E-08	4E-13	2E-08	5E-08		0.005	NA	0.004	0.009
Receptor Total				3E-08	4E-13	2E-08	5E-08		0.005	NA	0.004	0.009

NA = Not applicable or not available

Total Fingernails HI Across Media = 0.009

Total Eyes HI Across Media = 0.009

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

RISK CALCULATIONS USING MAXIMUM DETECTED CONCENTRATIONS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Wader / Sunbather
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment Exposure Unit 2	Total PCBs	6E-08	NA	2E-07	3E-07	Fingernails, Eyes	0.004	NA	0.01	0.02
		Exposure Point Total		6E-08	NA	2E-07	3E-07		0.004	NA	0.01	0.02
	Exposure Medium Total			6E-08	NA	2E-07	3E-07		0.004	NA	0.01	0.02
	Ambient Air	Ambient Air Exposure Unit 2	Total PCBs	NA	1E-12	NA	1E-12	NA	NA	NA	NA	NA
		Exposure Point Total		NA	1E-12	NA	1E-12		NA	NA	NA	NA
	Exposure Medium Total			NA	1E-12	NA	1E-12		NA	NA	NA	NA
Medium Total				6E-08	1E-12	2E-07	3E-07		0.004	NA	0.01	0.02
Receptor Total				6E-08	1E-12	2E-07	3E-07		0.004	NA	0.01	0.02

NA = Not applicable or not available

Total Fingernails HI Across Media =	0.02
Total Eyes HI Across Media =	0.02

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

RISK CALCULATIONS USING MAXIMUM DETECTED CONCENTRATIONS

OU2, Twelvemile Creek Site, Pickens County, South Carolina

Scenario Timeframe: Current/Future
Receptor Population: Wader / Sunbather
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Sediment Exposure Unit 2	Total PCBs	1E-07	NA	8E-08	2E-07	Fingernails, Eyes	0.04	NA	0.02	0.07
		Exposure Point Total		1E-07	NA	8E-08	2E-07		0.04	NA	0.02	0.07
	Exposure Medium Total			1E-07	NA	8E-08	2E-07		0.04	NA	0.02	0.07
	Ambient Air	Ambient Air Exposure Unit 2	Total PCBs	NA	3E-13	NA	3E-13	NA	NA	NA	NA	NA
		Exposure Point Total		NA	3E-13	NA	3E-13		NA	NA	NA	NA
	Exposure Medium Total			NA	3E-13	NA	3E-13		NA	NA	NA	NA
Medium Total				1E-07	3E-13	8E-08	2E-07		0.04	NA	0.02	0.07
Receptor Total				1E-07	3E-13	8E-08	2E-07		0.04	NA	0.02	0.07

NA = Not applicable or not available

Total Fingernails HI Across Media = 0.07

Total Eyes HI Across Media = 0.07